DOCUMENT RESUME

ED 142 202 IR 005 055


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|---|---|
| AUTHOR | Bikson, Thomas H. |
| TITLE | Classroom Observation: A Case Study in Obtrusiveness. |
| INSTITUTION | Rand Corp., Santa Monica, Calif. |
| SPONS AGENCY | Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C. |
| REPORT NO | P-5804 |
| PUB DATE | Feb 77 |
| CONTRACT | 300-75-0123 |
| NOTE | 70p. |
| AVAILABLE FROM | The Rand Corp., Publications Dept., 1700 Main Street, Santa Monica, Calif. 90406 ($5.00) |
| EDRS PRICE | MF-$0.83 HC-$3.50 Plus Postage. |
| DESCRIPTORS | Case Studies (Education); *Classroom Observation Techniques; Classroom Research; *Evaluation; Field Studies; Interaction Process Analysis; *Research Methodology; Teacher Educator Education; Teacher Educators |



ABSTRACT

A case study is presented concerning an observation methodology that advocates an anthropological approach to such data collection, and, in particular, demonstrates the effectiveness of a highly interactive role for the classroom observer. Part I traces the development of an observation methodology that originally assumed a noninteractive model on the part of the observer to a highly interactive model on the part of the observer (RANDSIGHT Observation System) that developed from the author's experience in the field, both as a classroom observer and a trainer of classroom observers. It is argued that the only way not to be disruptive as an observer is to interact with the classrooms' "ecosystem" in such a way as to become a familiar and nonthreatening part of that environment. It is concluded that "... the disruption effect of observing a classroom varies inversely with the extent of the observer's assimilation with the classroom ecosystem." In Part II the RANDSIGHT Observation System is presented, as is the data collected through its use in the field. (Author/DAG)



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# CLASSROOM OBSERVATION: A CASE STUDY IN OBTRUSIVENESS

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February 1977

P-5804

IR000506

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A case study is presented concerning an observation methodology that advocates an anthropological approach to such data collection, and, in particular, demonstrates the effectiveness of a highly interactive role for the classroom observer.

In Part I we trace the development of an observation methodology that originally assumed a noninteractive model on the part of the observer (as exemplified in Risley and Cataldo's PLA-Check, 1973) to a highly interactive model on the part of the observer (as exemplified in the RANDSIGHT Observation System) that developed from the author's experience in the field both as a classroom observer and a trainer of classroom observers. In brief, we argue, contrary to the prevailing view, that the only way not to be disruptive as an observer is to interact with the classrooms' "ecosystem" in such a way as to become a familiar and nonthreatening part of that environment We conclude that "... the disruption effect of observing a classroom varies inversely with the extent of [the observer's] assimilation with the classroom ecosystem".

In Part II we present the RANDSIGHT Observation System and the data collected through its use in the field. The data presented in Part II serve two functions for this case study. First, they show the results of using an interactive classroom observation model; and second, the classroom observation data thus collected constitute part of an evaluation of an on-going Rand project. We consider this a partial demonstration of the effectiveness of using just such a model.

## PREFACE

This paper represents the evolution of an observation methodology advocating an anthropological approach[1] to such data collection and, in particular, demonstrating the effectiveness of a highly interactive role for the classroom observer.

I will first introduce the reader to the context of this methodological study, indicating the nature of the research from which it developed. In two recent Rand educational demonstration experiments, I have been involved in the design and collection of observation data. Both projects are described briefly below, to provide a basis for discussing the role of observation methodology. While the two studies provide contrasting instances of approaches to classroom observation, one project assumes primary importance for substantiating the methodological approach to be advocated here.

Following these accounts, Part I of the paper looks at the anthropological approach within the context of field experimentation and in contrast to the prevailing counter methodology--a methodology that advocates a noninteractive role for the observer, particularly for a classroom observer. Part II then presents the results achieved by assuming a highly interactive role as a classroom observer of an educational intervention.

Introduction to the Research Context

The primary research project serving as an instance for discussion is entitled "Interactive Classroom Television Systems", hereafter referred to as ICTS.* The ICTS is a closed circuit TV system designed for partially sighted elementary school students. The system not only allows a student to look at his TV screen and see a bright, high-contrast, magnified image, but allows students to interact with each other through the system's capabilities. Each system station consists of (i) a writing platform that moves both vertically and horizontally with adjustable margin stops; (ii) a station camera aimed at the platform with zoom, aperture, focus, and height adjustments; and (iii) a TV monitor with brightness and contrast controls. In addition, there is a remote-controlled camera mounted on the ceiling with a zoom capability that can be focused on nearly everything in the room including the students and the teacher(s), the teachers' desks, and the chalkboard. All stations function interactively through a control board located at the teacher station. This control board governs the image shown at any station; briefly, any station may view the image from its own platform, or all stations may view the same image, or any combination thereof. Finally, the ICTS enables the teacher to project two images, from two different locations on the same screen. There is the split screen capability where one image appears above (below) the other; and an overlay capability where one image is superimposed on the other. In short, the ICTS enables a partially sighted student to develop his/her residual vision and to do so interactively, thus approximating a regular classroom environment.

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*See Bureau of Education for the Handicapped (BEH) Proposal, Contract 300-75-0123, September 1974. For a more complete description of the ICTS see Ref. 2. For additional information see Refs. 3, 4 and 5.

The second research context to be discussed is a study of multiple options in education. In 1972 a voucher demonstration model was approved for Alum Rock School District in San Jose, California.[5,6] In general, voucher plans are designed to introduce the market mechanism into the educational system in the following way: (i) Schools agree to provide multiple educational options; (ii) parents choose the schools their children will attend; (iii) in order to pay the schools of their choice, parents receive certificates--vouchers--from a governing agency, which redeems the vouchers against public funds upon receiving them from schools. In particular, the Alum Rock model differed from other prevailing models in that (iv) only public schools were involved rather than private schools and (v) teachers' job tenure and seniority rights were guaranteed, regardless of the number of voucher-bearing students. In Alum Rock voucher schools called "mini-schools" were in fact series of classrooms within a regular public school environment. Approximately 50 mini-schools were formed within 14 public schools. Rand was funded by the National Institute of Education to evaluate the model.

The author's involvement with the voucher demonstration began January 1976 and ended April 1976. Part of Rand's evaluation effort was concerned with showing whether or not differences existed between voucher and nonvoucher classrooms. My responsibilities included helping with observation instrument development, training of classroom observers, data management and dissemination.

PART I: OBSERVATION METHODOLOGY

In Part I we trace the development of the present observation methodology that originally assumed a noninteractive model (on the part of the observer as exemplified in Risley and Cataldo's PLA-Check, 1973) to a highly interactive model (on the part of the observer) that developed from the observer's experience on the ICTS project and as a trainer of classroom observers on the Alum Rock Voucher Demonstration project. In brief, we argue that the only way not to be disruptive as an observer is to interact with the classrooms' "ecosystem" in such a way as to become a familiar and nonthreatening part of that environment. We conclude that "... the disruption effect of observing a classroom varies inversely with the extent of [the observer's] assimilation with the classroom ecosystem".

Ideally, direct observation of an experimental social setting should be done without the observer being present. The contradictory nature of this statement is, however, only apparent--there are one-way windows, hidden cameras and the like, used with varying degrees of success. Call this the "hidden observer gambit"--it appears to satisfy the goal of social science data collection in that the observee is less likely to alter his/her behavior due to the presence of an observer.* For a variety of reasons, being a hidden observer was not possible at either research project. Short of that, according to accepted doctrines, if the observer has to be present, then said observer ought be as unobtrusive as possible.

*The hidden observer in this gambit cannot be totally hidden, that is, research ethics codified by law demand that subjects agree to the possibility of being observed even though the observer may not be present. Nevertheless, simply the knowledge of being observed may influence behavior.

In order to get meaningful data about appropriate participation in classroom activities, your observations should be made in such a way that they do not disrupt the classroom activities.

A. *Do not* interact with the children. You should not make prolonged eye contact or engage in any form of social interaction with the children. If you do not know what to do with yourself during the part of the minute you are not taking a PLA-Check, try looking at the teacher. This will avoid interaction with the children and tend to discourage their interest in you.

B. If you are told by the teacher to sit in a particular seat, *stay there*. If you are free to move about the room while taking data, do so as inconspicuously as possible so that you do not draw attention to yourself. Stay out of the teacher's and children's way.[7]

Whereas we can agree with Risley and Cataldo's first sentence, the prescriptions that follow (points A, and B.) and what they seem to imply, strike this observer as unworkable and at odds with their first sentence--at least in the two classrooms I was observing, and given the nature of the data to be collected. The only way this observer did not disrupt classroom activities was to interact with both students and teachers. The mere fact of observer presence in the classroom draws attention, reappearing regularly draws even more attention; noting data on a clipboard, peering at a student or group of students, then writing on a clipboard again draws attention. In short, the mere fact of an observer's regular presence in a classroom establishes the very interaction that Risley and Cataldo demand we observers avoid. It is pointless to split hairs on the use of 'interact'. One might retort that Risley and Cataldo are asking for minimal interaction (not its complete absence). and given this "minimal" interaction then the observer fades into the background--color him an irrelevant context variable; i.e., the observer sufficiently fades so that his presence (or absence) does not affect subject's behavior.

To presume such a state of affairs strikes this observer as both naive and insidious. The reader is asked to image one 150 lb male adult moving about the classroom (as observers must), peering intently at the subjects (as he must), but avoiding eye contact as much as possible (as Risley and Cataldo prescribe) particularly if they happen to look at him, writing something--they know not what, and finally (whether introduced or not) all the adults including the observer act as if he were not among them (as prescribed by Risley and Cataldo) and continue to do so week after week. These negative arguments are captured in the following narrative.

> As will be explained below, we deliberately set out to establish rapport with the subjects. Having done so with the protagonist of this narrative, the same subject was certain to ask me--the observer in this case--each week what I was doing. His inquiry was not hostile; in fact his inquiry was most appropriate since I did not perform any role he could recognize. I was neither a teacher, nor a resource specialist (mobility instructor, testing psychologist, braillist, speech therapist, and so on) nor a visitor. (I was not a visitor in the sense that I kept reappearing week after week and I was doing something--and it had to do with him/them.) The gist of what I told our protagonist, and I'm paraphrasing here, is that I observed anyone using the ICTS and recorded those observations. Now I should point out that he (as were all the subjects) was aware of Rand project personnel, that the system was "from" Rand, and that I worked for Rand. He still persisted in asking why I did what I did? Again, the thrust of my response was that we were interested in how students in fact worked with the system, how well it helped them read and write, and the like. I told him this on approximately six different occasions--after the last time, I saw the gestalt in his eyes, he looked at me, grinned, and said, "Oh yeah, I know, you spy on us, you're a spy".

An observer is a spy--a bit harsh perhaps but very close to the truth. Given Risley and Cataldo's original PLA-Check, and instructions for use, an observer must judge whether or not a student is in fact "participating" in a given activity; 'participating' is operationally defined per activity, and, since we're dealing with describable behavioral parameters, it is allegedly

nonevaluative.* The very next step in working with this data is to determine the percent of participatory behavior, so we can say over time these students were participating n% of the time, not participating n% of the time, and the like. Teachers will take this as an evaluation of their teaching, as they rightfully may; "good teaching maximizes participatory behavior and minimizes nonparticipatory behavior" says Risley and Cataldo (though perhaps not so baldly), and that's a value-laden comment on teacher performance.

On a much simpler level, one can see that an observer evaluates; students and teachers know that, short of being some kind of recording automation, an observer can't help but judge, think, form an opinion about teacher effectiveness and student work. What observer doesn't say to him or herself that that (event) is great, good, fair, or mediocre--or words to that affect? It makes no difference whether that judgment is expressed to anyone else or not. Everyone, or at least almost everyone, knows that judging is going on. Again, real or imagined, an observer, be he a stranger or not, is a threat and a spy; if not counteracted, any observer remains conspicuous and thus disruptive. How then can an observer become less disruptive, less of a threat? We propose the following two rules of thumb:

1. Publicly acknowledge the obvious! Any observer or visitor violates the normal interaction patterns existing among students, teacher, and aides. To more or less pretend that you're not here, or that you are not making any evaluative judgments, is patently absurd, disrespectful, and dishonest. It is

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*We're all aware of the retort that we "scientists" merely describe what is going on, but refrain from making any value judgments (saying that a given behavior is good/bad/right/wrong). However, even presuming that some paradigmatic behaviors are easily observed and recorded as participatory or not, there is a large grey area where it's not so easy to tell. It could go either way; and that's making an evaluative judgment, rather than a routine classification.

imperative that the observer publicly acknowledge (a) the fact of his/her intrusion to the teacher if not the students; (b) the reason(s) for the observations, and what will be done with the data collected. The usual canons of etiquette pertain here. What we are recommending is an attitude set by the observer: (whether or not the observation has been mandated is irrelevant). An observer violates a specific classroom space and as much as possible said observer qua guest should accommodate his/her schedule to that of the teachers. To behave otherwise is to heap insult upon injury--at the very best this first rule of thumb can help avoid insult. The following corollaries should be mentioned: (c) all observations are arranged beforehand and cleared with the teacher, not merely his/her supervisors; (d) consult with the teacher how best to handle your intrusion and thus your introduction to the class; (e) as long as the teacher's prescriptions fall within the parameters of what must be observed, there is no problem; if they do not, arrive at a consensus before the observation takes place. Publicly acknowledging your status as an intrusion (observer) allows the teacher(s) and students to have a role in minimizing your disruptive effects.

2. Become assimilated with the "ecosystem"* of the classroom. This second rule presumes that observations occur repeatedly, and, of course, the assimilation process will be conditioned by those time parameters.

Consider now the following: You have followed rule 1 to the letter--all arrangements and introductions have been made; you have even visited the classroom to be observed and have made initial contact with the subjects. It's now

*As an observer, one will likely deal with a number of individuals outside of but interfacing with the classroom population--from the principal to other teachers to a whole variety of district personnel, to other students, parents, custodians, etc.; other rooms/spaces may also be involved, depending on the context.

your first day to observe--what do you do when you walk into the classroom? The age of your subjects and how fully they've been briefed will determine in part their "conceptual" understanding of your presence. Nevertheless, at this stage you're still a spy, consequently a threat, and thus disruptive. There are two ways to go. You can make no interaction with classroom population, avoiding prolonged eye contact, generally behaving as if you were not really there. Or you can deliberately disrupt the classroom proceedings (if not the entire classroom, at least make your presence known to the teachers); you may greet the population, establish eye contact, shake hands, inquire what's happening, tie a kid's shoe, etc., etc. By so doing, you have acknowledged the obvious--you are intruding and at least you're being honest about that (unlike the first option). Moreover, you've begun the assimilation process by letting both students and teachers know that you are approachable; you have begun the process of becoming familiar to the population you are observing.

This assimilation process takes time and it must not be forced. Do what it takes to let the population know that you are approachable, and let both parties to the observation determine the extent and conditions of the interaction; let them approach you, let them adjust to you and relate to you, in a way that is comfortable for both of you. Most of this is just common sense. You allow the interaction to happen, after all you are invading their space; however you can guide the interaction, particularly in cases where the behavior become inappropriate.

The extent to which assimilation takes place diminishes the threat and disruption of your role as an observer. As it happened to me, described below, I would walk into an ICTS classroom, greet and be greeted by the population;

shortly thereafter it was business as usual. Interactions occurred while I was there, even during observation intervals; however, these interactions neither disrupted ongoing class activities nor prevented me from making my observations. Generally, I was able to move freely about the room; to peer intently at subjects, and to record my data, without being overtly noticed by the population.

What I will describe below are two ecosystems in which I participated (and from which the two rules were derived); the ICTS study, where I have the role of observer as well as evaluator; and the Alum Rock Voucher Demonstration where I had the role of trainer of classroom observers. I believe these two cases delineate opposing extremes and that most observation contexts will fall somewhere between.

Alum Rock

The comments that follow are my impressions; any coincidence with the views of other Voucher personnel whether Rand project staff, Alum Rock teachers, District personnel, et al, can only reflect the sagacity of their impressions.

Rand successfully collected classroom observation data and did so under extremely adverse conditions. In general the teachers involved in the observation study felt harassed and extremely suspicious of both Rand and District personnel. This was borne out of their responses to our classroom observers, ranging from open hostility to passive aggression with few exceptions. The most frequently heard view of the teachers toward the study was that the observers were spies;* that Rand and District personnel were, in collusion with the observers, obtaining privileged information thinly disguised as research data; that this data really would be used to evaluate their job proficiency. Jobs were becoming scarce, overall enrollment was down and

*We have heard this before--see p. 5.

teachers (whether Voucher or not) were due to be laid off. Then adding fuel to the fire, the observers were substitute teachers from their own district, several of whom were seeking full time teaching jobs. In short, some teachers felt that they were to be observed and thus evaluated by teachers less qualified than they, some of whom were out to get their jobs.

Obviously Rand could do nothing about declining enrollment and subsequent layoffs; nor were we going to change our qualifications for the observers--we required research assistants who were familiar with the Alum Rock schools and classrooms. Successful completion of the observation, with only one week of training time allocated, demanded our use of substitute teachers. Rand's attempts to allay teachers' fears met with little success per se.

For example, Rand maintained that District personnel could not get their hands on individual observation records, and an elaborate system for safeguarding confidentiality had been installed so that data could not be linked to a recognizable classroom or teacher. Rand's only interest was in how the voucher demonstration as a whole worked, while the District--which was interested in assessing teachers--had its own independent machinery for evaluation. Somehow, despite these reassurances, the teachers' evaluation apprehension was never fully overcome, yet they complied. In part they had to--the study was mandated by NIE and they were ordered to comply.

It is my own opinion that many of the teachers' fears were well-grounded and reinforced over 4 years of the demonstration; but that is not the point of this discussion. My objective has been to set the stage, to develop a context in which this set of classroom observations took place, and took place successfully, despite an extremely hostile environment in which the intrusion of observers would be most disruptive.

In regard to the two rules discussed above, all we in fact did or could do was to publicly acknowledge the obvious (rule 1). Assimilation (rule 2) was "impossible" given our own self-imposed constraints vis-a-vis the observation research design.* How we acknowledged the obvious is instructive as a paradigm, suggestive of what can be done in other hostile environments coupled with extreme time limitations. To a large extent, Rand was forced to acknowledge the obvious. The observation study had been tried before and failed--failed, as far as this writer is concerned, because of the manner in which the teachers were handled. Previously, Rand had to rely on the District for actually carrying out the data collection procedures. The prevailing opinion among teachers to be observed is that they were informed and dictated to, but not consulted by District staff about research policies that affected them and their classroom environment. Furthermore, as we have noted, the teachers were particularly sensitive since there was a possibility of cutbacks in teacher personnel. Toward the end of the 1974-75 academic year, it was apparent that attempts to conduct the observation study had failed, and since participation was [illegible]ry,** there appeared to be no way to remedy the situation--the [illegible] to rebel. Without the cooperation of the teachers, [illegible] possible and therein lay the core of the proposed cla[illegible]ation. For Rand, the order of the day was both to respond to the teachers' legitimate grievances and to collect classroom

*Constraints included only one week for training observers, a maximum of 1 1/2 months of classroom observation, any given classroom could be observed no more than 4 times, and no observer observed the same classroom more than twice.

**In this situation teachers correctly saw that failure to volunteer could be held against them, which only added more fuel to their collective hostility.

observation data. To that end Rand agreed to perform the study only if NIE agreed to certain conditions--of which the following two are relevant to this discussion: (1) that NIE mandate the 1975-76 observation study, replacing covert pressure to participate with an openly obligatory procedure; (2) that Rand would assume complete responsibility for data collection.

However, mandated or not, to scuttle the project, all the teachers had to do, for example, was to call in sick a few times on target dates--easy enough during a flu season that was hitting epidemic proportions. If this happened frequently in the initial stage of work, the study would not go. Enter a new Rand observation team, "new " in the sense of not previously involved with the Alum Rock classroom study. Forewarned, we adopted an attitude of deference toward the teachers as recommended above. The following steps were taken:

(i) We consulted with the teachers in the creation of the observation instrument; sections and items they found objectionable were either significantly revised or simply eliminated.

(ii) All key concepts in the observation study were operationalized and observers were drilled in their use of these terms--applying them to videotapes of classrooms and actual classroom visits. What this yielded was a common language, not only necessary to complete the observation uniformly, but to allow different observers to present similar perspectives to the same teacher. In presenting a unified front, researchers gave teachers the same story, even in those cases where disagreements arose concerning the use of concepts.

In general, having a common language made it considerably more difficult for teachers to find fault on the grounds of observer subjective bias.*

(iii) During the training sessions, observers were sufficiently informed of the history and difficulties with the Alum Rock Demonstration in order to sensitize them to the situation and to enlist their aid in devising strategies to cope with expected confrontations--ranging anywhere from passive aggression to downright hostile behavior. Those of us doing the training were extremely sympathetic to the teachers' concerns and genuinely upset with the way the teachers had been treated in the past. In no way did we deny Rand's contribution to previous difficulties. Our posture was well received by the observer-trainees, who, far from feeling competitive, felt a great deal of empathy with the teachers.

(iv) An elaborate system was set up to confirm and reconfirm observation dates with the teachers directly. There was extremely little leeway for schedule changes; we made them when we could, attempted to persuade to the contrary when we could not, and lost very few.

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*I refer here to interpretive, not perceptual bias. The point is that all the categorizing terms were familiar to the non-educator and educator alike. However, we found these terms to be terribly vague, and in some cases ambiguous. For example, I ask the reader to distinguish between academic and nonacademic subjects and activities; or, what constitutes a group as distinct from a collection of students.

(v) Needless to say, teachers were very curious to see the data collection instrument both before and after it had been completed by the observer. (Not all teachers had seen the forms, particularly the revised version.) Strategies were developed to deal with what we thought to be a very explosive situation. The explosions did not occur--at least two reasons come to mind: (a) most if not all of the teachers knew that objectionable (to them) portions had been removed from the instrument; and (b) they found the actual observation to be much less threatening than they had imagined.

The observations took place, the study was completed. This means that not only did the teachers not rebel, they actively cooperated in the end. I didn't think of this at the time, but we approached the training, the problems involved, as anthropologists and not "hot-shot" evaluators expecting their due. I cannot help but think that this attitude-set was at the very least the necessary condition without which the study would not have been completed. It boils down to a genuine respect for territory and person; not only did we publicly acknowledge the obvious--we behaved accordingly.

ICTS

Above I referred to my involvement in the two observation studies as representing extremes--the oppositions are notable:

(i) The Alum Rock Observation study ran a total of 3 months; ICTS is running 3½ years minimum with at least 2½ years of actual classroom observation on a semi-weekly basis.

(ii) Obviously Rand had to negotiate with the school districts (Santa Monica and Rowland Heights) concerning permission to incorporate the ICTS in their Visually Handicapped programs as well as the actual physical placement of the systems (Madison and Killian School respectively). Once that was settled, the visually handicapped teachers were immediately involved in all phases of the project. In fact, after "permission was granted" by the districts, the teachers became the focal point. In Alum Rock, District personnel were the focus; and, up until our involvement in that project, teachers were informed after the fact rather than consulted in decisions about research that would affect them.

(iii) In Alum Rock we dealt with 92 teachers, 92 classrooms, and several thousand students; compare that with 3 teachers, 2 classrooms and 13 students total for the ICTS study.

(iv) On paper, Alum Rock represented a global educational change; economically, with the voucher concept, administratively, with an increased and coordinated involvement among teachers, students and parents; and programmatically, with voucher classroom designed to be alternatives to the regular classrooms. The ICTS study has a single focus; viz., the intervention of the closed circuit TV (CCTV) system as instrumental to the cognitive and affective growth of partially sighted students. CCTV's were known to help for obvious reasons; they made the difference between seeing or not seeing given material. However, the ICTS system incorporated interactive functions (hence the name) which, unlike the CCTV, allows visual communication with the teacher, fellow students and classroom environs including the chalkboard. No one really questions that the interactive capabilities are impressive, and

expensive; the question is whether they in fact increase basic skill achievement. Or is the system simply a fascinating albeit sophisticated electronic system that allegedly approximates a "normal" classroom setting for the partially sighted--an important contribution in its own right, independent of academic achievement.

(v) Whereas the relation between observers and Alum Rock teachers had to be quite formal and handled with "kid-gloves", my relation with the ICTS teachers has been quite informal and achieves colleague status.

It is now possible to summarize the two studies in light of the two rules of thumb. It should be clear that publicly acknowledging the obvious (rule 1) was built into the ICTS study from the beginning--unlike Alum Rock, where we had to scramble after the fact, and were almost too late. The point is that we worked with teachers of the visually handicapped from the beginning. They had to be trained to use the ICTS. This training began the assimilation process (2nd rule) as well. When I joined the study, the Madison system had been operating for 1½ academic years under a grant from Rehabilitation Services Administration. A new contract was negotiated through the Bureau of Education for the Handicapped for the second system (Killian School in Rowland Heights); the contract called for an extensive evaluation package including classroom observations. Obviously I (the designated observer) had to learn how both systems operated, so I became a student with the three teachers.

In short, before I stepped into either visually handicapped classrooms as an observer/evaluator I established (de facto) a colleague relationship with the teachers. My threat-potential, as seen by the ICTS teachers was/is

almost nonexistent; it was/is quite clear to them that my evaluation was/is of the system and its effect on student academic achievement and affect. Regardless of whether we (Rand) could show significant gains, e.g., with achievement scores, their own positions were in no way threatened. I simply ask the reader to note the dissimilarities here from the deep suspicions of the Alum Rock teachers, some of whom believed that the observation data would be used against them. Moreover, during the ICTS training period, I met school principals, testing psychologists from both districts, and the respective directors of special education. Unlike the Alum Rock response, everyone welcomed Rand with open arms; and for good reason--we came bearing gifts: an expensive, sophisticated piece of equipment and a lot of favorable PR by the media.

In contrast with Alum Rock, I had it made, so to speak. The first day I walked into the classroom I was warmly greeted by my colleagues (the teachers), who introduced me to the students; and though little was said about my specific functions, the fact that I was on the Rand project with "Big Sam" and "Hu" insured at least preliminary acceptance of my position.* Subsequent weekly exposures guaranteed my assimilation as part of the classroom ecosystem. I cannot appeal to hard data here; however, the above scenarios should provide some basis for the claim that the disruption effect of observing a classroom varies inversely with the extent of assimilation with the classroom ecosystem.

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*"Big Sam" and "Hu" refer to Samuel M. Genensky, Ph.D. and Project Director, and Dr. Hubert L. Moshin, project optometrist--both of whom examined each student at our RANDSIGHT lab prior to their acceptance as subjects.

I will close this section with two comments about my behavior in the classroom that turned out to aid the assimilation process. I was introduced to the students and was subsequently referred to as Dr. Bilson. I was uncomfortable with that; it seemed too formal, unnecessary, and not in keeping with my role. In time I requested that both students and teachers call me by my first name. I think my response, more instinctual than premediated, was correct. Above all I did not want to be seen as another teacher--that role (obviously inappropriate) would have interfered with my observation time. In both classrooms teachers were called by the title "Mr." or "Mrs.", aides, by their first names. So went the pecking order. It is doubtful that my functions were understood by most students; in any case calling me by my first name served two ends: (a) I was seen on a level with aides not teachers (though I clearly was not an aide since I was not in a subordinate role to teachers), and (b) I became more approachable given the informality that the use of first names brings. Finally, I was able to assist and interact with the students when I was not observing. I helped them make adjustments, looked at their work, in some cases monitored their progress. In short, I was actively not passively engaged. Without exception, if I was approached while making an observation all I need say was (words to this effect) ...can't now, I'm working...".

## II. RANDSIGHT OBSERVATION DATA: CASE STUDIES

In part II we present the RANDSIGHT Observation System (ROS) used to collect the observation data for the ICTS project, as well as a graphed and tabled summary of the collected data. Comparative descriptions of the Madison and Killian sites are presented to provide the relevant context for any preliminary interpretation of the descriptive data.

### A. Comparative Site Descriptions

In order to understand the graphs and tables presented below, comparative site descriptions are needed. They provide a context for interpretation of the observation data as well as for other aspects of system evaluation. Below are presented 10 factors for comparison, including explanatory notes where necessary.

| ITEM | SITE DESCRIPTIONS |
|---|---|
| 1. Number of Subjects: | There were 5 subjects at Madison with a mean attendance of 4.4. There were 8 subjects at Killian with a mean attendance of 5.55. |
| 2. Number of Adults: | At Madison there was 1 regular teacher and 1 regular aide; however the mean number of adults was 2.53. At Killian there were 2 teachers and 3 regular aides, with a 6.19 mean number of adults. "Adult" refers to anyone beyond elementary school age, and in particular, includes district resource personnel, parents, Junior and Senior High School student aides. It does not include ICTS project observers. |
| 3. Number of Students: | At both sites, class rolls and actual number of students attending varied; absenteeism was only one factor. Figures below indicate the number of students on the class roll, then the overall mean of attending students. Both classrooms include students who are not project subjects.<br><br>At Madison there were 8 students on the class roll, with a mean number of 5.86 attending. At Killian there were 15 on the class roll with a mean number of 10.01 attending. |

4. Nonsubjects: At Madison there are three: 1 totally blind; 1 with slight residual vision but not enough to qualify as a subject; and one student at K level (the K student becomes a subject in the '76-'77 year). At Killian there were generally 7 nonsubjects; the number varied as other students would spend part of their day in the classroom. There was one totally blind student who left midyear.

4.1 Student: Adult Ratio: At Madison the ratio was 2.64 : 1; and at Killian the ratio was 1.98 : 1.

5. Classroom Size: At Madison the room was approximately 18 x 32 or 558 square feet; and at Killian the room was approximately 64 x 32 or 2048 square feet--almost 4 times larger than Madison.

6. ICTS Space: This is space occupied by ICTS equipment including student and teacher stations, videotape recording equipment, and a room monitor. At both sites approximately 50% of the total space was used: at Madison, 279 sq. ft.; at Killian, 1024 sq. ft.

7. Number of ICTS Stations: Originally, there were 3 student stations and 1 teacher station at Madison; however with 5 subjects the teacher station became a student station. Except for use of the X-Y Platform, teacher station functions were relegated to the room monitor and room camera. Even with this change, 2 subjects had to share the same station. At Killian, there are 7 student stations, and 1 teacher station.

8. Type of Classroom: Both sites are VH classrooms, however, Madison is a "regular" VH room, whereas Killian is a "self-contained" VH room. The difference is that the Madison students are systematically enrolled in some regular ("normal") classrooms appropriate to their normal grade level, whereas Killian students generally are not.

The Madison classroom is open from 8:45 to 11:30 for basic skill instruction--all students regardless of grade level are in attendance at this time. At 11:30 they break for lunch, and then proceed to their afternoon classroom. With each student the VH and regular classroom teachers do whatever is necessary to facilitate this type

of integration. In some cases the VH teacher provides materials for the regular classroom teacher to use; in other cases integration requires no additional materials.

The Killian classroom has the following schedule:

(i) PreK and K meet from 8:30 to 12 Monday through Friday.
(ii) Grades 1-3 meet from 8:30 to 1:30 Monday through Friday.
(iii) Grades 4-6 meet from 8:30 to 2:30 Monday through Friday except Wednesdays, when the class day closes at 1:30.

Being self-contained, the Killian classroom provides not only basic skill instruction but a full range of learning experiences including P.E., art, music and so on. However, some students according to their specific needs may also participate in the adjoining resource room or may be integrated into a regular classroom.

9. Age of Subjects in Spring 1976. At Madison, the ages range from 6 years 8 months to 11-3, with a mean age of 9.52. At Killian the ages range from 5-5 to 12-5, with a mean age of 7.83.

10. Achievement of Subjects: In terms of CTBS and CIRCUS achievement test scores for reading and mathematics, Madison subjects are performing at grades 1 through 5. Killian subjects are performing at preK and K through 3.

## B. The RANDSIGHT Observation System (ROS)

Observation data collection began in September 1975; the format was revised in November 1975 to better reflect the intervention of ICTS. This revised format was continued through May 1976 and will be used throughout the 1976-77 academic year. The revised RANDSIGHT observation system is designed to organize observation data regarding levels of participation in academic tasks by students in the ICTS classrooms. Below are excerpts from a project memo describing the evolution of the ROS.

In the original proposal to evalute the impact of the ICTS on basic skill learning, the Planned Activity Check (PLA-Check, Risley and Cataldo, 1973) was to be used to document students' involvement in academic tasks. PLA-Check was designed to allow an observer to make a systematic check of task-participation behavior relatively free from observer bias and value judgments. It is a "low inference" instrument. Knowing beforehand what activities are planned to occur on a given day in a classroom, the observer simply scans the classroom at fixed intervals and records: how many students are present for the activity ("attending"); how many of those present are on-task ("participating") rather than off-task; and the percentage of the total number present that the latter group comprises.

A set of such structured time-sampling observations, collected semi-monthly from the experimental classrooms, was intended to yield a description of classroom behavior that would allow us to evaluate the effect of the ICTS on task performance. In particular, it was hypothesized that the intervention of the ICTS would lead to relatively greater percentages of on-task behavior in the Killian classroom as both students and teachers could work more effectively. That is, the system would allow teachers to conduct group activities or to assign students independent machine-mediated tasks; consequently, much less time would be spent waiting or in bored inactivity.

However, after almost two months of classroom observing, PLA-Check proved to be inadequate both in terms of the level of discrimination of the task behavior it affords and in terms of being able potentially to document the effect of the ICTS on task involvement. First, a simple on-versus-off discrimination will not permit us to determine whether a student is using a machine or not and if so, the extent to which the machine is mediating his task behavior. Second, in the original PLA-Check instrument, the "nonparticipating" category blurred distinctions between waiting behavior and behavior explicitly inappropriate to the designated activity; it also blurs the distinction between transitional behavior and off-task behavior. Third, in both classrooms, the student-teacher ratio is exceptionally low--much lower than the normal ratio represented in the classrooms in which PLA-Check is typically used. There the ratio is usually 30 : 1; in both the Madison and Killian classroom the ratio is never higher than 5 : 1 and very often it is 2 : 1. Given these ratios there is virtually no opportunity for a student not to participate in an assigned task, with or without the use of the ICTS. Moreover, given these low ratios, it is important to distinguish teacher mediated participation on a 1 : 1 basis from on-task behavior where a teacher is not required to mediate the activity. Thus, while percent of participation would not change significantly after introduction of the ICTS, the nature of the task performance might well shift; to document such changes we would need an instrument capable of assessing extent of ICTS use for task performance with or without teacher guidance.

For these reasons, the RANDSIGHT observation instrument (RAND ICTS CLASSROOM OBSERVATION I, see p. 28) was developed. The new instrument makes behavior discriminations which are blurred in the original instrument and which are nevertheless significant for any assessment of ICTS use. Operational definitions for all items on the ROS instrument follow.

The new ICTS observation sheet distinguishes three kinds of behavior: (1) behavior with the ICTS, (2) behavior in making a transition from one activity to another, and (3) behavior not involving the system. The rationale for distinguishing ICTS behavior from non-ICTS behavior is cited above: we want to know both the extent to which the system is being used and the impact of the system on student behavior. However, the rationale for distinguishing transitional behavior is not quite so clear. First, with the original PLA-Check, transitional behavior is scored simply as non-participating behavior. The ICTS classroom teachers felt that this classification was unfair since the students are told to make the transition; and, for those who proceeded as directed, the teachers contended they were fully participating. Second, we are not interested in transitional behavior per se; rather, we make the distinction so as not to confuse this type of behavior with either ICTS or non-ICTS behavior.

Except for the transitional behavior category, the ICTS and non-ICTS categories are divided into mode and function. The mode tells us how students are related to any given activity. These mode discriminations are important in assessing the impact of the ICTS. We need to distinguish, for example, its use as an individualized optical aid only from its interactive uses, which may be the extent to which the students are involved in any given activity. A general rationale for more refined functional discriminations (over the original PLA-Check instrument) was given above; further clarification follows within the operational definitions for each function cited below.

Time: Observations are done at fixed intervals, 3 minutes apart, for continuous 15 minute periods. Each data sheet, then, represents 1 hour of observing time. The 15-minute segments may or may not be consecutive depending on the activity involved. We are primarily concerned with academic task behavior and less concerned with behavior during free time or play time.

MODE: (For ICTS activities)

IND: Individual Station monitor displays the image from the (same) station camera. In other words, the student* is seeing his own work, and is working independently of the other students even though other students may be working on the same assignment. In this mode the student is using the system as an individualized optical aid only.

INT-T: Teacher Mediated Interaction.

This mode corresponds with the mode titled 'Group-T' for non-ICTS activities. At least two station monitors are displaying the same image** regardless of its source, and, the activity is directly mediated by a teacher/aide. This is exactly like a regular classroom situation; a one-many*** relation obtains between the teacher and the class, allowing for interaction among the students as well.

INT-P: Peer Mediated Interaction.

This mode is distinguished from the Teacher Mediated Interactive mode in that a teacher/aide is not mediating (in a directive sense) the activity, although the teacher/aide may be present as another participant. As above, at least two students must be involved with the same task; and either they are simply doing it together, or one of the students is tutoring the other.

ICTS: (Extent of participation at an ICTS station)

onT/onS: (on-Task/on-System) 'On-Task' means that the student is actively participating in a teacher-designated task--in this case an ICTS task; 'on-System' means that the student is (1) adjusting his camera and monitor, or (2) looking at the monitor's image while participating in the assigned task.

---

*This may include 2 (or more) students at the same station under adult direction.

**In the case of split images (see p. 1), only the image from any one given station need be the same.

***Int-T as well as Int-P allows for a one-one relation between adult/peer and student if and only if 2 station monitors are sharing the same material.

w/ADULT: This function differs from the previous function in two respects: (1) There is a 1 : 1 relationship between adult and a student. Generally, the adult will be either a teacher or an aide, but given the constant flow of visitors in these classrooms it could refer to a number of other adults. 'Adult' refers to anyone beyond the elementary school level. (2) Student is on-task, but may or may not be on-system; since the student is working under the guidance of an adult, or is under adult observation, the student's focus may be the adult and not the monitor.

onT/offS: To be on-system, the necessary and sufficient condition is that the student is looking at his station monitor. Previous classroom observations have shown that students do not always use the monitor even though they may be fully on-task. The extent to which a student does not use the station monitor depends on his/her visual acuity or other visual parameters and familiarity with the system.

WAITING: This behavior occurs within a designated activity (as distinct from transitional behavior), where the subject is waiting for assistance from a teacher/aide/peer and he/she is not using the equipment. Waiting-behavior is clearly appropriate within many designated activities, but it is not doing-behavior.

off-Task: Subject's behavior falls outside the parameters designated above. In this case the subject is not using the equipment, nor waiting, nor in transition, and/or creates a disturbance sufficient to require the intervention of an adult.

TRANS: (Transitional behavior) a teacher/aide has directed an individual or the class to end one activity and to begin or proceed to another. Here on-versus-off discrimination is sufficient.

ON: Student proceeds as directed. Behavior will of course vary depending on the activity involved. Generally, however, specific directions are given, e.g., "go to a center", "line up at the door", etc.

OFF: Student does other than as directed, or creates a disturbance sufficient to require the intervention of a teacher/aide.

MODE: (For non-ICTS activities)

The mode discrimination here are defined in the same way as for ICTS activities with the obvious exception that they do not involve ICTS mediation. A non-ICTS activity, then, is any activity specified to occur in some location other than an ICTS station.

non-ICTS: (Extent of participation in any activity except those at an ICTS station)

The four functions listed are defined as above except that on-system, off-system discriminations are not relevant here. Hence 'onT/onS' has as its analogue 'on-TASK' only, and 'onT/offS' has no analogue.

#/childs: (Number of children/students)

In this column we record the total number of students in the classroom including subjects and non-subjects.

#/adults: In this column, we record the total number of adults present in the classroom including teachers, observers, visitors, etc.

COMMENTS: This section, including the space above each 15 minute time sample, will include any information that may prove helpful for interpreting the time samples. For example, the observer will denote the kind of activity involved, where it is taking place, a roll call of subjects including those who leave (or come in) during a time sample, etc.

To facilitate creation of graphs, the "RAND ICTS CLASSROOM OBSERVATION II" was developed--a form (see sample, p. 28) that simply sums in percentages the relevant data. Except for the far left column, each is numbered and reflects, by percent, the number of subjects in that mode or function. For example, suppose there were five subjects being observed, the number 5 would go in the "# of SUBJECTS PRESENT" column; then, their percentage distribution would be mapped over the modes and functions, columns 1 through 17. Continuing the

example, of the 5 subjects say that 3 or 60% were in ICTS mode 'INT-T', and 2 or 40% were in non-ICTS mode 'IND'--a 60 and 40 are written in columns 2 and 11 respectively. Percentage figures only are recorded in the numbered columns. Finally, columns 4 through 8, and columns 14 through 17 show the different functions within each mode. Suppose of our 3 subjects in the ICTS mode, one was waiting, one was off task and one was with an adult--the figure 20 (reflecting 20%) would go in columns 7, 8 and 5 respectively; if the 2 subjects in the non-ICTS mode were on task, then a 40 (reflecting 40%) would go in column 14.

The sum of columns 1 through 3, 9 and 10, and 11 through 13 equals 100%. Likewise, the sum of columns 4 through 8, 9 and 10, and 14 through 17 equals 100%. (Columns 9 and 10, TRANS, are anomalous in that they merge both mode and function.) Summing the above columns provides an easy crosscheck; however, there is another equally useful, perceptual crosscheck. The 15 minute time segments in OBSERVATION II line up exactly with those in OBSERVATION I. While recording the data from I to II, it is easy simply to check to see if the same spatial arrangement occurs.

Finally, columns 18, 19, 20 (SUMS) provide the percentage totals upon which the graphs were constructed. As the reader will note, column 18 yields 'ON TASK' behavior as defined by Risely and Cataldo. Columns 19 and 20 yield ICTS modes and functions respectively. (Details will be found below in the text describing each graph.)

# RAND ICTS CLASSROOM OBSERVATION I

SITE: PAGE: 1

DATE: OBSV:

| TIME | MODE: IND. | MODE: INT - T | MODE: INT - P | ICTS: onT/onS | ICTS: onT/offS w/ADULT | ICTS: onT/offS WAITING | ICTS: off-TASK | TRANS: ON | TRANS: OFF | MODE: IND. | MODE: GRP - T | MODE: GRP - P | NON - ICTS: on-TASK | NON - ICTS: w/ADULT | NON - ICTS: WAITING | NON - ICTS: off-TASK | total #/adults | total #/childs | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

# RAND ICTS CLASSROOM OBSERVATION II

SITE:

PAGE: /

DATE:

ORSV:

| # of Subjects + | MODE | | | ICTS | | | | | TRANS | | MODE | | | NON - ICTS | | | | SUMS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | IND. | INT - T | INT - P | ont/ons | w/ADULT | ont/offs | WAITING | off-TASK | ON | OFF | IND. | GRP - T | GRP - P | on-TASK | w/ADULT | WAITING | off-TASK | ON TASK S=(1-3) | S=(4-7) | |
| 20 4 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| | | | | | | | | | | | | | | | | | | ↳ S=(4,5,6,14,15) | | |
| 1% | | | | | | | | | | | | | | | | | | | | |
| 2% | | | | | | | | | | | | | | | | | | | | |
| 5% | | | | | | | | | | | | | | | | | | | | |
| 10% | | | | | | | | | | | | | | | | | | | | |
| 15% | | | | | | | | | | | | | | | | | | | | |

Revised 3/3/76tb
Revised 9/7/76tb

C. TABLES AND GRAPHS

Observation data were collected over a nine month period. During September and October 1975, the PLA-Check instrument was used; in November the RANDSIGHT Observation System (ROS) was implemented. The ICTS at the Madison site became operational November 1973; however, at Killian, the ICTS became operational November 1975. Table 1 below indicates the dates of observation, the amount of observation time per date, a cumulative total overall, and a cumulative total using the ROS.

Table 1 shows a total of 20 hours of ROS observation at Madison averaging 1.5 hours per day; and 11.5 hours of ROS observation at Killian averaging 1.0 hour per day. The differences here are expected since we are dealing with an established system at Madison, and one becoming operational at Killian. Many significant hardware changes were made with the Killian system, complicating the settling-in time necessary with any electronic equipment.

The graphs below indicate the percent of students participating in the indicated mode or function at systematically sampled time. The percentages graphed never mean the percent of time the ICTS was used in a given mode (although that information is deducible from the raw data). In other words, our observation focus is the subjects' use of the system--how many were using it, in what ways (the modes), and their on/off task behavior (the functions).

The systems themselves are on during the entire school day. The system is "in-use" from our point of view if and only if at least one subject is at a station doing (or not) a task designed for ICTS use. 'Empty time' then, is defined as 'none of the subjects are at station, or their being at station is accidental'--"hanging out", so to speak.

Table 1

1975-1976 Academic Year

| Madison | | | | Killian | | | | |
|---|---|---|---|---|---|---|---|---|
| Date | Hours | Cum | Revised Hrs. Cum. | Date | Hours | Cum | Revised* Hrs. Cum | ICTS** OPR. Cum |
| 9/23 | 1. | 1. | | 9/24 | 2.5 | 2.5 | | |
| 9/30 | 1.5 | 2.5 | | 10/1 | 1.5 | 4. | | |
| 10/14 | 1.5 | 4. | | 10/9 | 1.5 | 5. | | |
| 10/22 | .75 | 4.75 | | 10/15 | 1.5 | 6.5 | | |
| 10/28 | 2. | 6.75 | | 10/23 | .75 | 7.25 | | |
| 11/4 | 2. | 8.75 | 2. | 10/29 | 1.5 | 8.75 | | |
| 11/13 | 1. | 9.75 | 3. | 11/5 | .75 | 9.5 | .75 | |
| 11/25 | 2. | 11.75 | 5. | 11/12 | 1. | 10.5 | 1.75 | |
| 12/3 | 1.25 | 13. | 6.25 | 12/4 | 1.5 | 12. | 3.25 | 1.5 |
| 12/16 | 1.5 | 14.5 | 7.75 | 12/9 | 1.25 | 13.25 | 4.5 | 2.75 |
| 1/6 | 1.75 | 16.25 | 9.5 | 12/17 | 1. | 14.25 | 5.5 | 3.75 |
| 2/5 | 1.75 | 18. | 11.25 | 1/7 | 1. | 15.25 | 6.5 | 4.75 |
| 2/10 | 1.5 | 19.5 | 12.75 | 2/3 | 1. | 16.25 | 7.5 | 5.75 |
| 3/2 | 1.75 | 21.25 | 14.5 | 2/11 | .75 | 17. | 8.25 | 6.5 |
| 3/16 | 1.5 | 22.75 | 16. | 2/26 | 1. | 18. | 9.25 | 7.5 |
| 4/6 | 1.5 | 24.25 | 17.5 | 3/10 | 1. | 19. | 10.25 | 8.5 |
| 4/22 | 1.25 | 25.5 | 18.75 | 3/23 | 1. | 20. | 11.25 | 9.5 |
| 5/12 | 1.25 | 26.75 | 20. | 3/31 | 1. | 21. | 12.25 | 10.5 |
| | | | ($\bar{X}$ = 1.5) | 4/20 | 1. | 22. | 13.25 ($\bar{X}$ = 1.0) | 11.5 ($\bar{X}$ = 1.0) |

*Cumulative hours using the ROS.

**Cumulative hours using the ROS with the Killian ICTS operational.

During 20 hours of ROS observation at Madison, the average empty time was 27% or 16 minutes every hour of observation. During 11.5 hours of ROS observation at Killian, average empty time was 31% or 19 minutes every hour of observation. Without exception, subjects observed in ICTS mode were involved in basic skill learning (language or math skills) at both sites. Non-ICTS mode activities included everything else (and sometimes included basic skill learning also). In short, subjects were involved with ICTS-mediated basic skill learning 73% of each hour of observation at Madison, and 69% of each hour of observation at Killian.

Two sets of graphs are presented. Figures 1 through 3 reflect Madison data, and Figs. 4 through 6 reflect Killian data.

Figures 1 & 4: PLA-Check - ON-TASK

These figures graph on-task behavior as described in the original PLA-Check instrument (Risley and Cataldo, 1973) and charted in our previous Quarterly Reports.* In terms of the ROS, on-task behavior ranges over both ICTS and non ICTS modes, and includes all functions except 'waiting', 'off-task', and 'transitional' behaviors. (See above RAND ICTS CLASSROOM OBSERVATION II, column 18.)

Within any day, each data point represents a mean of 5 observation checks every 3 minutes for 15 minutes. For example, at Madison, on 1/6/76, 7 data points are graphed, representing 1.75 hours of observation. These data points are not necessarily continuous, and no attempt has been made to

*Specifically, the period from September through December 1975 appeared in our February and May 1976 Quarterly Reports.

distinguish consecutive from nonconsecutive segments.* Continuing the example, overall on-task behavior on 1/6/76, for 1.75 hours of ROS, was 75%; this means that 75% of the subjects were on-task during that observation interval. It follows that 25% of the subjects were either off-task, waiting, or in transition.

Figures 1.1 & 4.1: PLA-Check ON-TASK - Overall

These figures graph overall PLA-Check on-task behaviors; each data point represents a full day of observation ranging anywhere from .75 hours to 2 hours. Since we do not discriminate ICTS mode and function within these figures, we have started with the September '75 time samples. The dashed line indicates an overall mean of 70.5% on-task behavior at Madison, and 67.6% at Killian. These percentages are high, but expected given the extremely low student/teacher ratio of approximately 2 to 1.

Figures 2 & 5: ICTS Mode and ICTS ON-TASK - Behavior

These figures employ ROS observations only, consequently they start at 11/4/75 at Madison, and 12/4/75 at Killian. With these graphs, the dashed lines indicate ICTS modes; i.e., the percentages indicate the percent of subjects in any of the three ICTS modes (individual, teacher mediated interaction, peer mediated interaction). The solid line indicates the percent of ICTS participatory behavior including 'onT/onS', 'w/ADULT', 'onT/offS', and

*See p. 22, definition of 'time segment'. In short, 3 minute intervals are continuous within any 15 minute period, but not all 15 minute periods are continuous. In fact, for the 20 hours of ROS at Madison, 82% of the 15 minute time samples were continuous; the average time interval between noncontinuous samples was 28 minutes. And, for the 11.5 hours of ROS at Killian, 39% of the 15 minute time samples were continuous; the average time interval between noncontinuous samples was 37 minutes.

'waiting'. Unlike Risley and Cataldo, we include waiting behavior as "legitimate" participatory behavior, albeit passive behavior. Given Figs. 1 and 4, it is not surprising to see such a small difference between being in ICTS mode and being on-task in that mode.

Figures 2.1 & 5.1:ICTS Mode and ICTS On-Task Behavior - Overall

As in the previous set (1.1 & 4.1) the data points here are reduced, such that each data point represents observations taken during a given day. Comparing 2.1 with 5.1 shows that between November '75 and May '76, 55.77% of the subjects were in ICTS mode at Madison and that between December '75 and May '76, 41.2% of the subjects were in ICTS mode at Killian. On-task behavior in ICTS mode is 49.46% and 33.85% respectively. In short, off-task including transitional behavior at Madison in ICTS mode is only 6.31% of the subjects; at Killian it is almost the same, at 7.35%. Again, the small percentage of off-task behavior is in part due to the low student/teacher ratio. Clearly, off-task behavior is inversely related to on-task behavior. However, levels of off-task behavior depend on whether or not transitional and waiting behavior are included or excluded from the definition. Table 2 provides a complete account of off-task behavior variously defined.

Figures 3, 3.1 & 6, 6.1:ICTS Mode Discriminations

These graphs reflect the percentage of subjects in each of the three ICTS modes. The solid line represents the individual mode, the dashed line the teacher-mediated interactive mode, and the dotted line, the peer-interactive mode.

Table 2

OFF-TASK BEHAVIOR

Types of OFF-TASK Percentages, Defined By the Following Matrix:

| | ICTS mode + Transition | Non-ICTS Mode + Transition |
|---|---|---|
| waiting behavior excluded (ROS) | A | C |
| waiting behavior included (PLA-Check) | B | D |

Percent of Four Types of OFF-TASK Behavior Observed in Two Sites:

| Killian | | | | | Madison | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | A | B | C | D | Date | A | B | C | D |
| 12/4 | 31 | 38 | 26 | 28 | 11/13 | 13 | 19 | 17 | 18 |
| 12/9 | 18 | 27 | 6 | 8 | 11/25 | 44 | 44 | 25 | 34 |
| 12/17 | 25 | 25 | 28 | 28 | 12/3 | 26 | 28 | 37 | 37 |
| 1/7 | 53 | 53 | 29 | 30 | 12/16 | 24 | 26 | 33 | 35 |
| 2/3 | 11 | 11 | 21 | 22 | 1/6 | 14 | 15 | 15 | 19 |
| 2/11 | 10 | 12 | 8 | 11 | 2/5 | 24 | 27 | 16 | 16 |
| 3/10 | 25 | 32 | 43 | 44 | 2/10 | 14 | 18 | 7 | 9 |
| 3/23 | 29 | 39 | 50 | 52 | 3/2 | 18 | 21 | 12 | 14 |
| 3/31 | 45 | 46 | 37 | 28 | 3/16 | 14 | 19 | 23 | 23 |
| 4/20 | 42 | 47 | 43 | 45 | 4/6 | 16 | 19 | 14 | 14 |
| $\bar{X}$ | 31 | 34 | 30 | 31 | 4/22 | 23 | 32 | 30 | 21 |
| | | | | | 5/12 | 40 | 46 | 39 | 39 |
| | | | | | $\bar{X}$ | 22 | 26 | 21 | 23 |

A comparison of the mean totals on Figs. 3.1 and 6.1 shows a considerably higher percentage of students in the individual mode at Madison. In part this is due to the greater number of older students at Madison, working individually and independently at higher achievement levels. Killian was slightly higher in teacher-mediated interactive mode, in part due to a sizeable group of K-level subjects. One goal for this coming year will be to deliberately exploit the interactive potentials at both sites. To an extent this will be artificial; i.e., we will be "fitting" students and teachers to the system's capabilities.

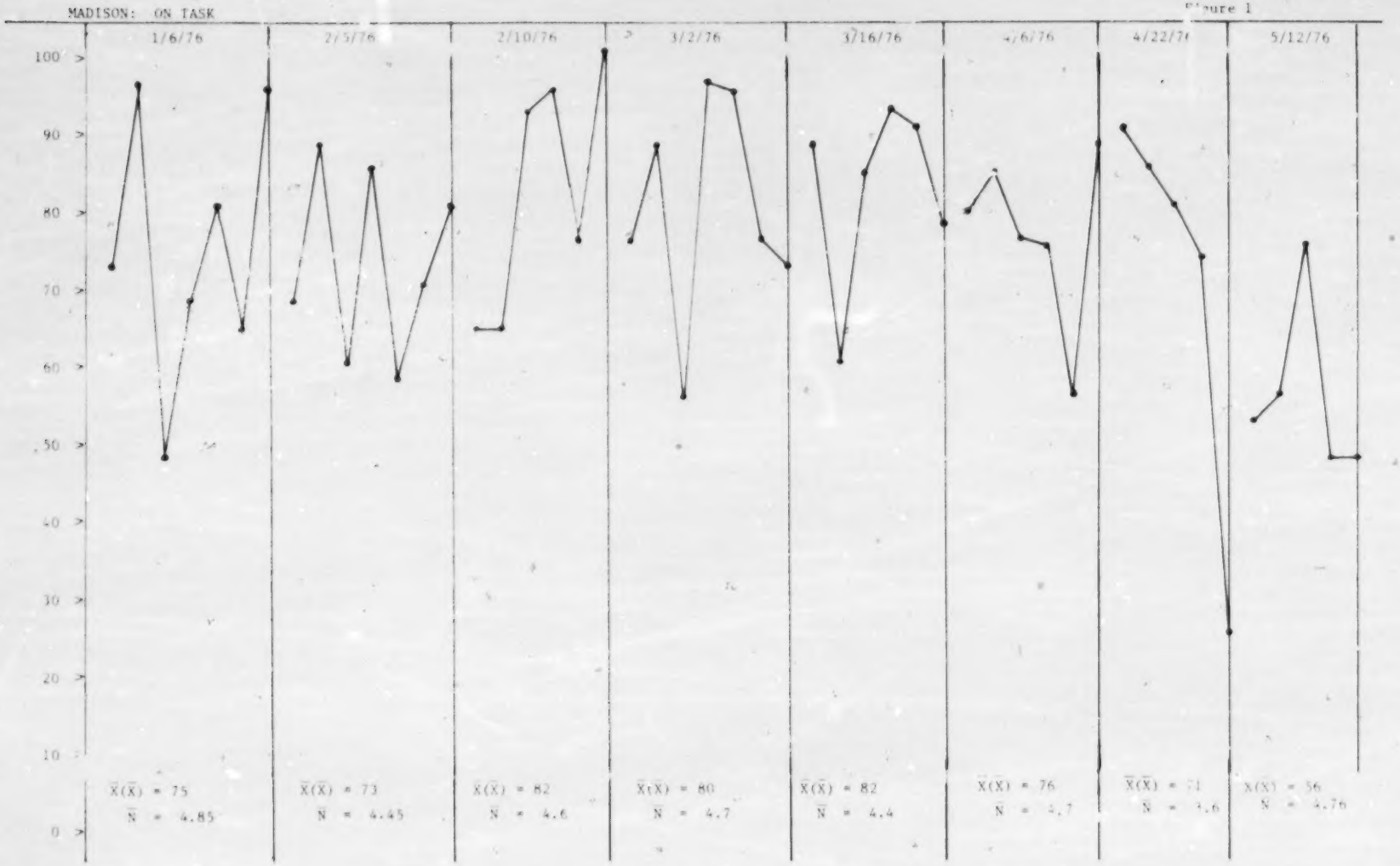

MADISON: ON TASK
1/6/76
2/5/76
2/10/76
3/2/76
3/16/76
4/6/76
4/22/76
5/12/76
100
90
80
70
60
50
40
30
20
10
0
X(X) = 75
N = 4.85
X(X) = 73
N = 4.45
X(X) = 82
N = 4.6
X(X) = 80
N = 4.7
X(X) = 82
N = 4.4
X(X) = 76
N = 4.7
X(X) = 71
N = 4.6
X(X) = 56
N = 4.76

Figure 1

MADISON: ON-TASK OVERALL

26.75 Hours Observation

Figure 1.1

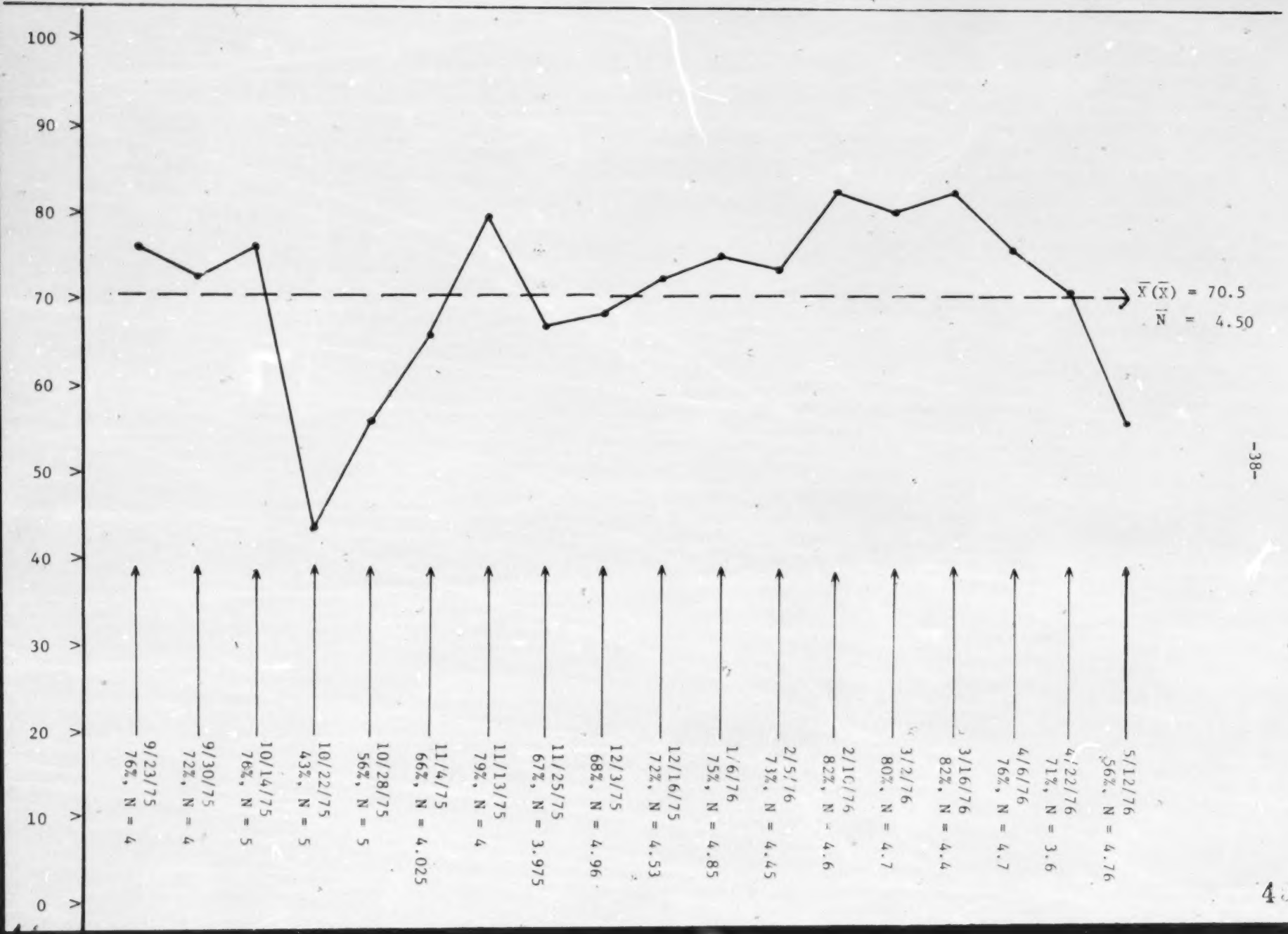
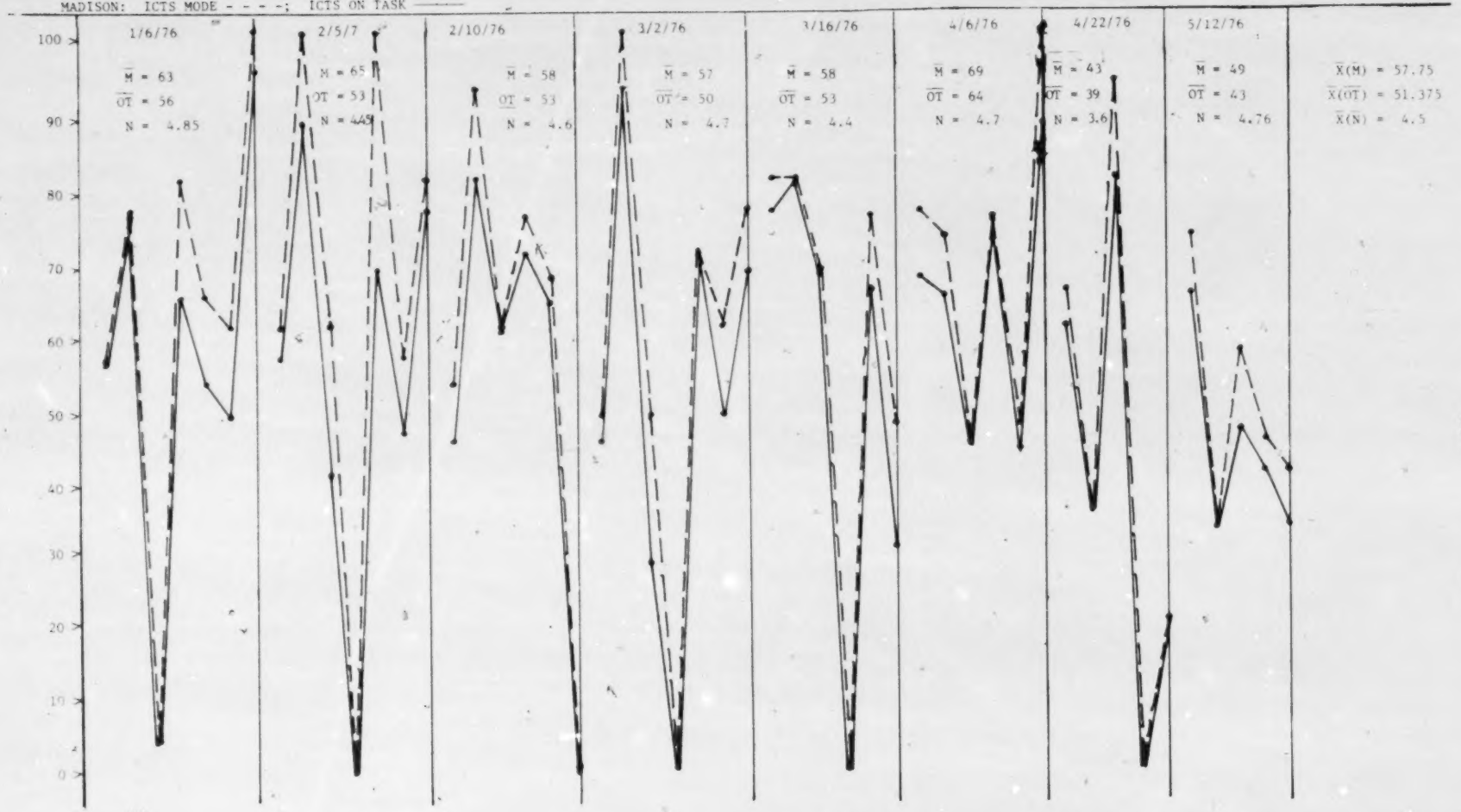
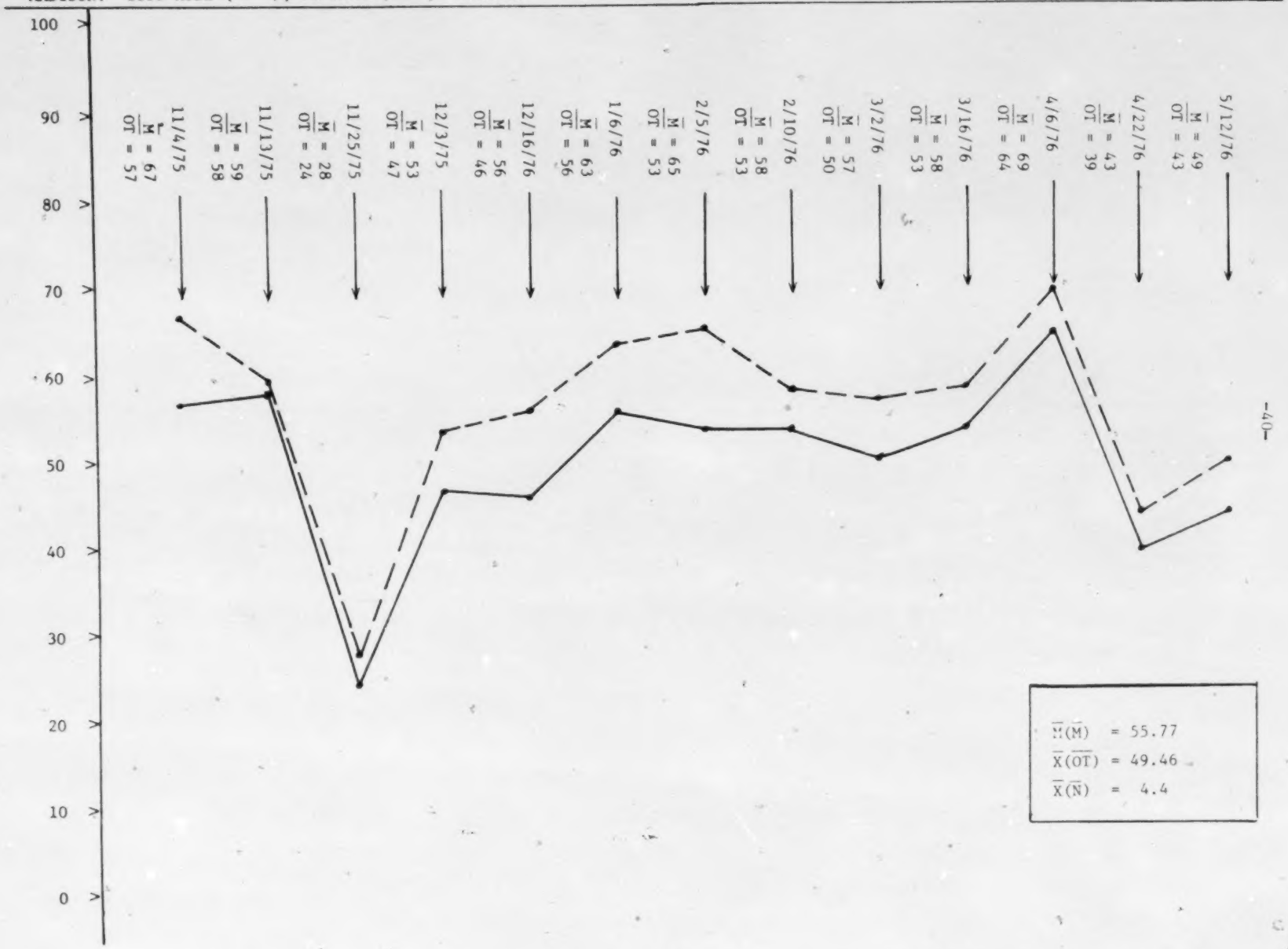


Figure 7


MADISON: ICTS MODE - - - -; ICTS ON TASK ———
100
90
80
70
60
50
40
30
20
10
0
1/6/76
M = 63
OT = 56
N = 4.85
2/5/7
M = 65
OT = 53
N = 4.8
2/10/76
M = 58
OT = 53
N = 4.6
3/2/76
M = 57
OT = 50
N = 4.7
3/16/76
M = 58
OT = 53
N = 4.4
4/6/76
M = 69
OT = 64
N = 4.7
4/22/76
M = 43
OT = 39
N = 3.6
5/12/76
M = 49
OT = 43
N = 4.76
X(M) = 57.75
X(OT) = 51.375
X(N) = 4.5

MADISON: ICTS MODE (----), ON TASK (——) OVERALL 20 Hours Observation Figure 2.1



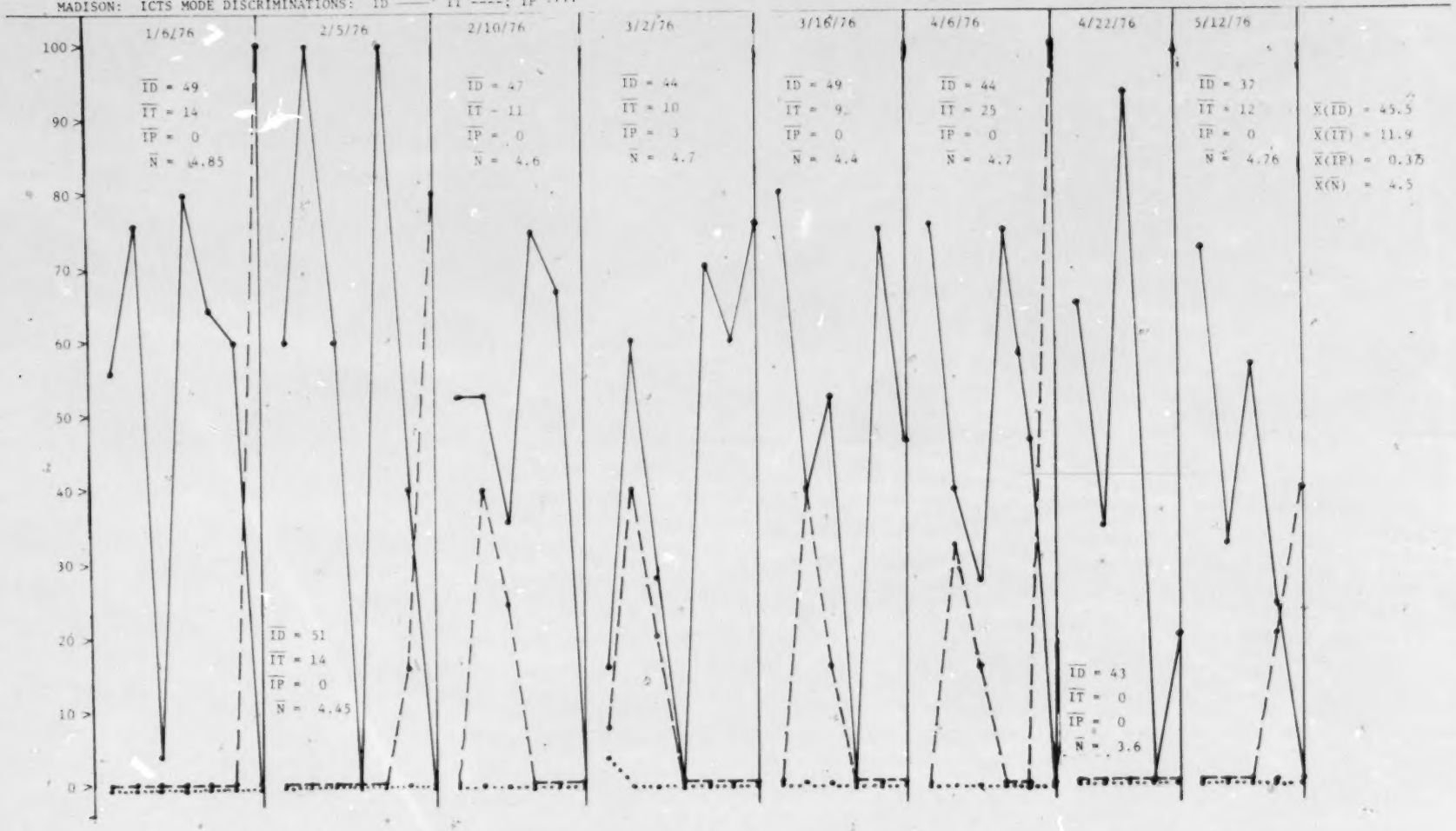
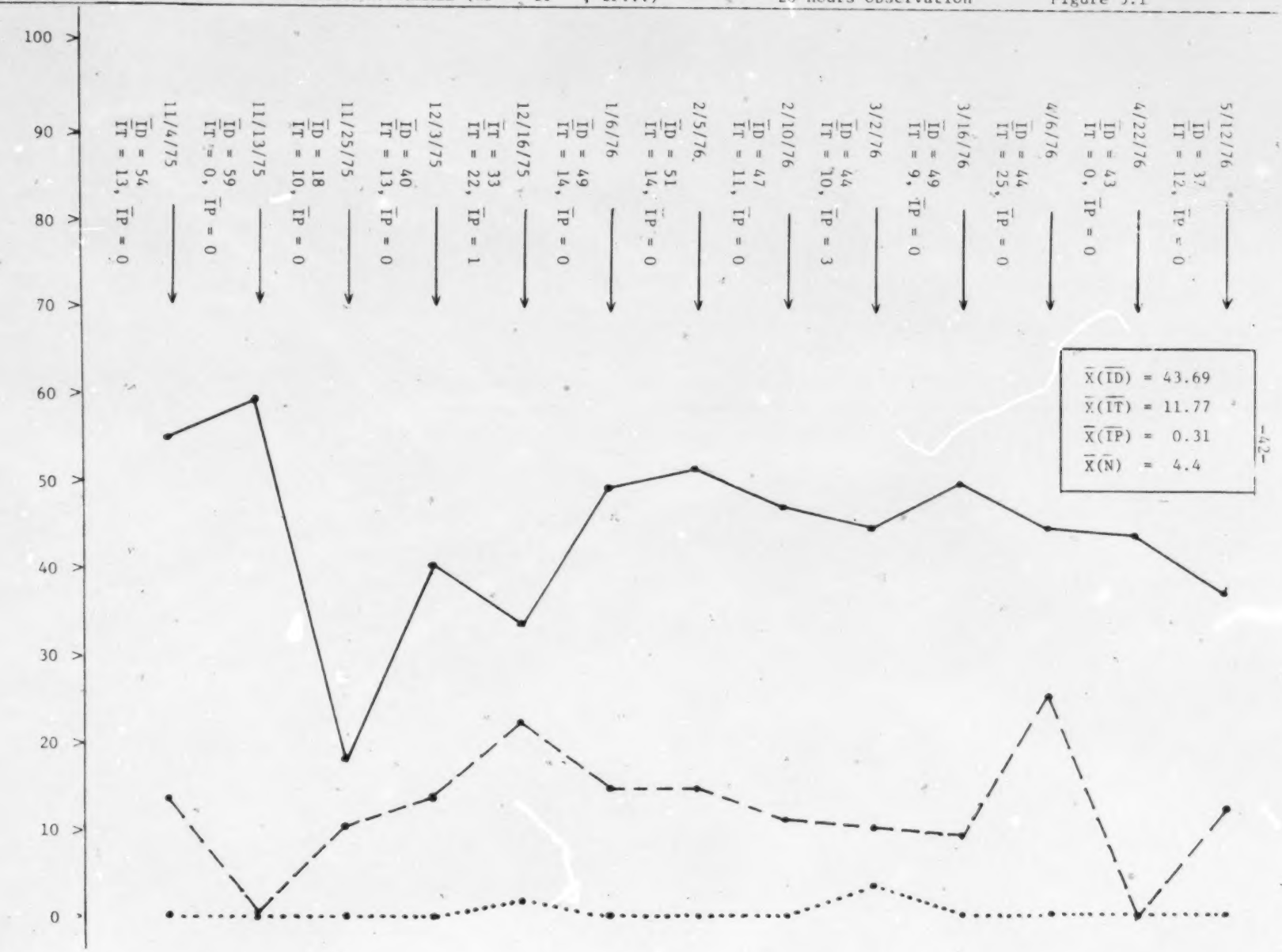

MADISON: ICTS MODE DISCRIMINATIONS: ID ——; IT ----; IP ····
1/6/76
2/5/76
2/10/76
3/2/76
3/16/76
4/6/76
4/22/76
5/12/76
ID = 49
IT = 14
IP = 0
N = 4.85
ID = 51
IT = 14
IP = 0
N = 4.45
ID = 47
IT = 11
IP = 0
N = 4.6
ID = 44
IT = 10
IP = 3
N = 4.7
ID = 49
IT = 9
IP = 0
N = 4.4
ID = 44
IT = 25
IP = 0
N = 4.7
ID = 43
IT = 0
IP = 0
N = 3.6
ID = 37
IT = 12
IP = 0
N = 4.76
X(ID) = 45.5
X(IT) = 11.9
X(IP) = 0.35
X(N) = 4.5
100
90
80
70
60
50
40
30
20
10
0

Figure 3

MADISON: ICTS MODE DISCRIMINATION OVERALL (ID—' IT---, IP...) 20 Hours Observation Figure 3.1


100
90
80
70
60
50
40
30
20
10
0
11/4/75 $\bar{ID}$ = 54 $\bar{IT}$ = 13, $\bar{IP}$ = 0
11/13/75 $\bar{ID}$ = 59 $\bar{IT}$ = 0, $\bar{IP}$ = 0
11/25/75 $\bar{ID}$ = 18 $\bar{IT}$ = 10, $\bar{IP}$ = 0
12/3/75 $\bar{ID}$ = 40 $\bar{IT}$ = 13, $\bar{IP}$ = 0
12/16/75 $\bar{IT}$ = 33 $\bar{IT}$ = 22, $\bar{IP}$ = 1
1/6/76 $\bar{ID}$ = 49 $\bar{IT}$ = 14, $\bar{IP}$ = 0
2/5/76 $\bar{ID}$ = 51 $\bar{IT}$ = 14, $\bar{IP}$ = 0
2/10/76 $\bar{ID}$ = 47 $\bar{IT}$ = 11, $\bar{IP}$ = 0
3/2/76 $\bar{ID}$ = 44 $\bar{IT}$ = 10, $\bar{IP}$ = 3
3/16/76 $\bar{ID}$ = 49 $\bar{IT}$ = 9, $\bar{IP}$ = 0
4/6/76 $\bar{ID}$ = 44 $\bar{IT}$ = 25, $\bar{IP}$ = 0
4/22/76 $\bar{ID}$ = 43 $\bar{IT}$ = 0, $\bar{IP}$ = 0
5/12/76 $\bar{ID}$ = 37 $\bar{IT}$ = 12, $\bar{IP}$ = 0
$\bar{X}(\bar{ID})$ = 43.69
$\bar{X}(\bar{IT})$ = 11.77
$\bar{X}(\bar{IP})$ = 0.31
$\bar{X}(\bar{N})$ = 4.4

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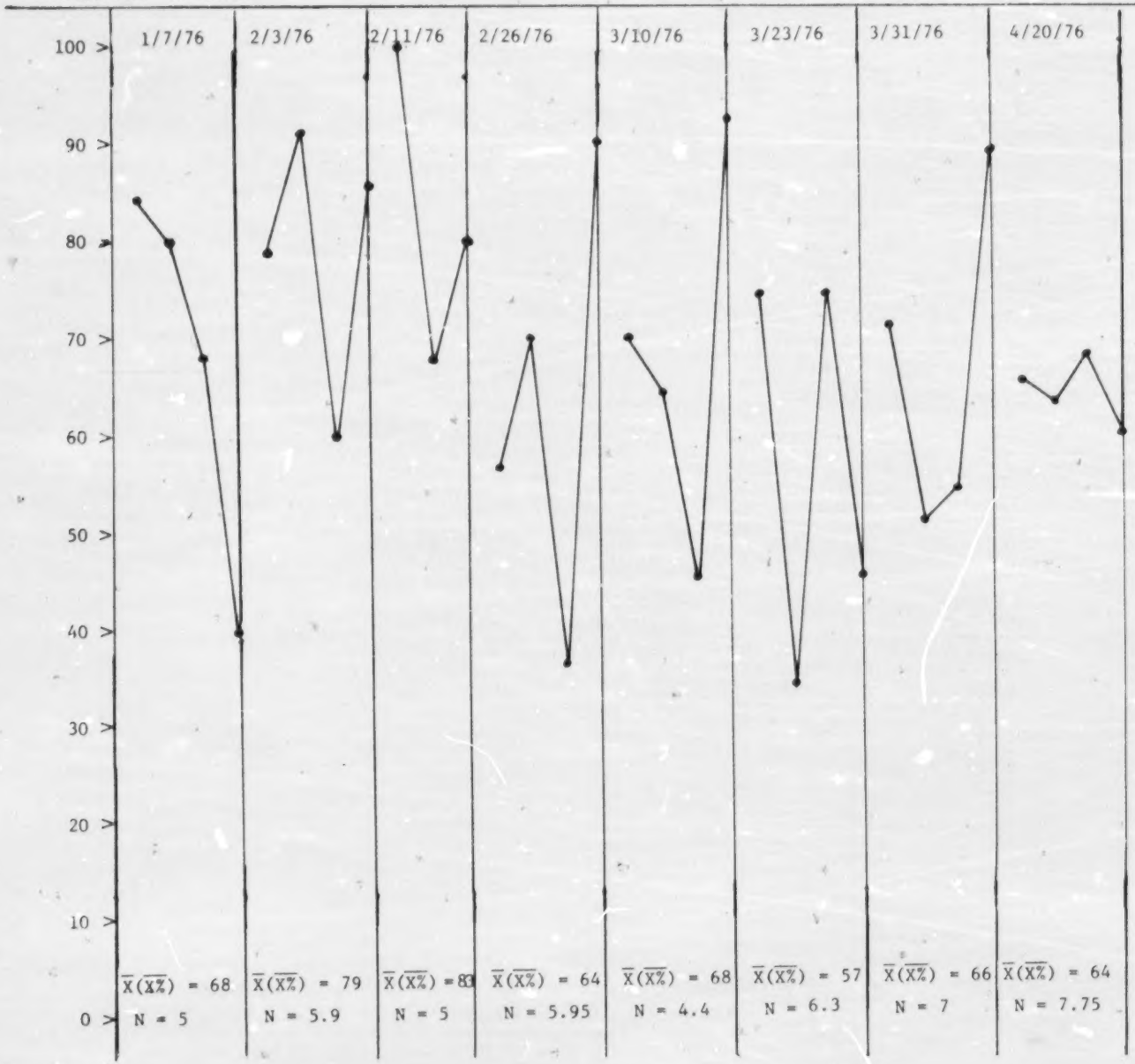
KILLIAN: ON TASK

Figure 4



KILLIAN: ON TASK OVERALL — 22 Hours Observation — Figure 4.1

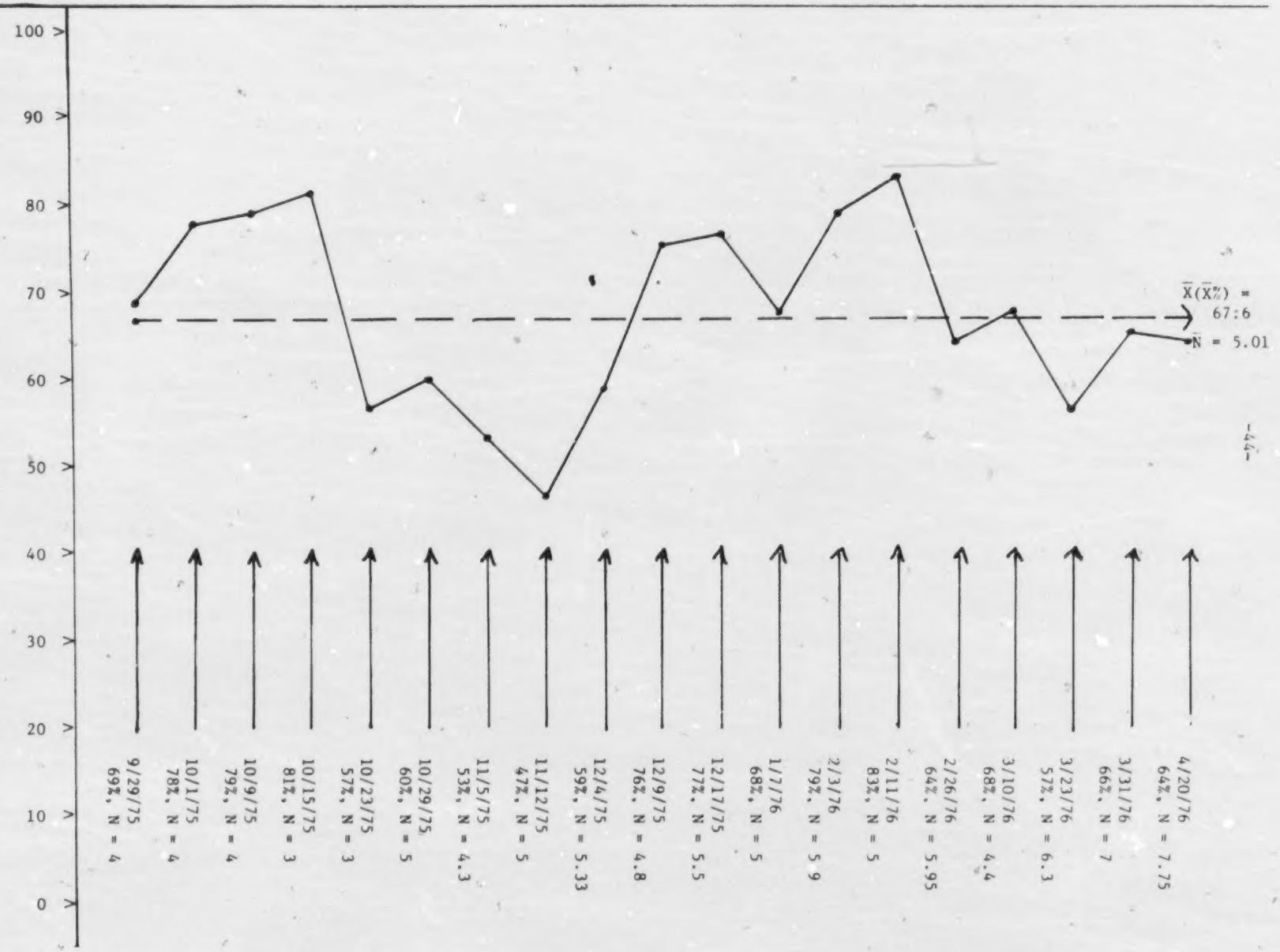
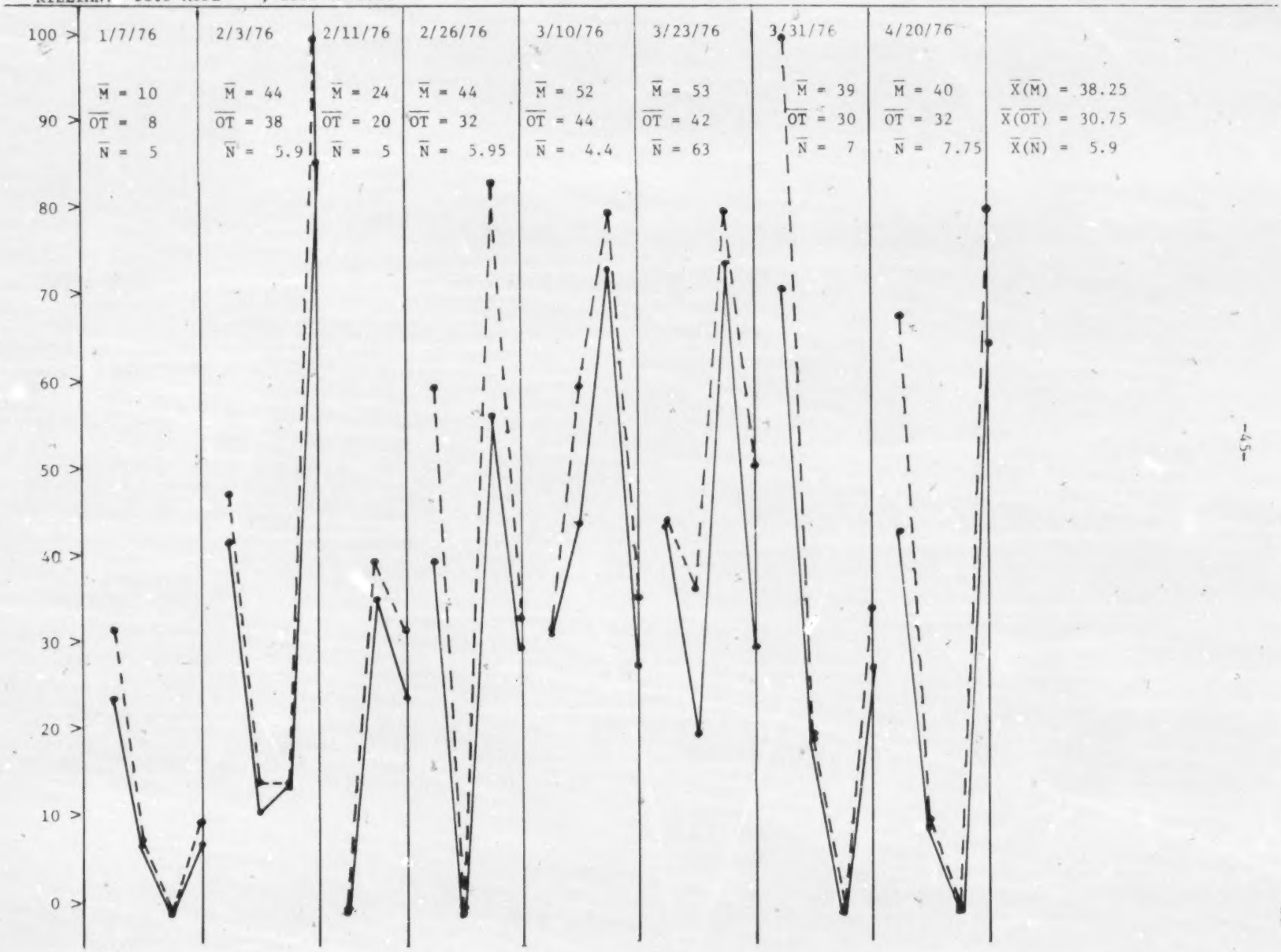
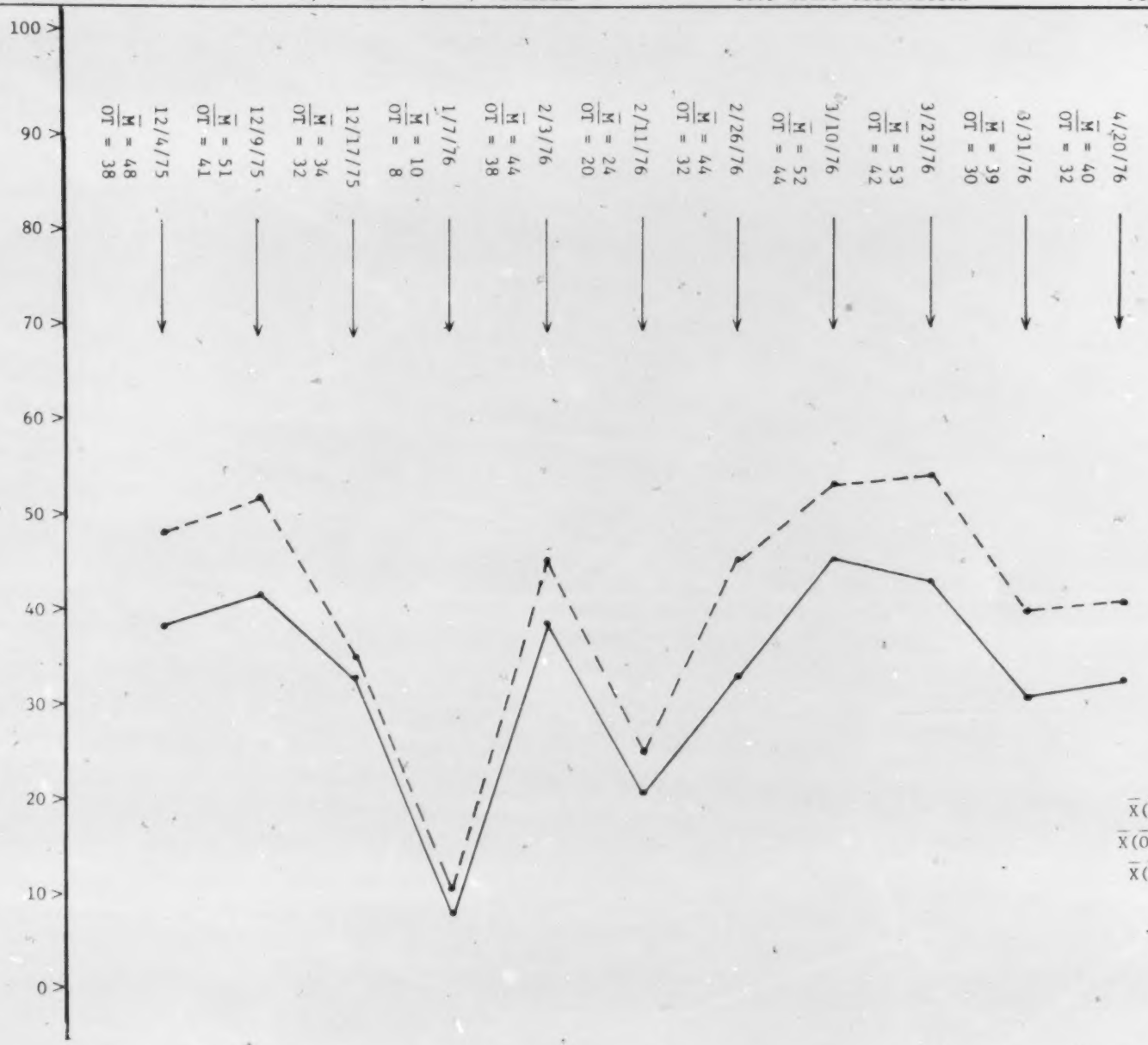


Figure 5

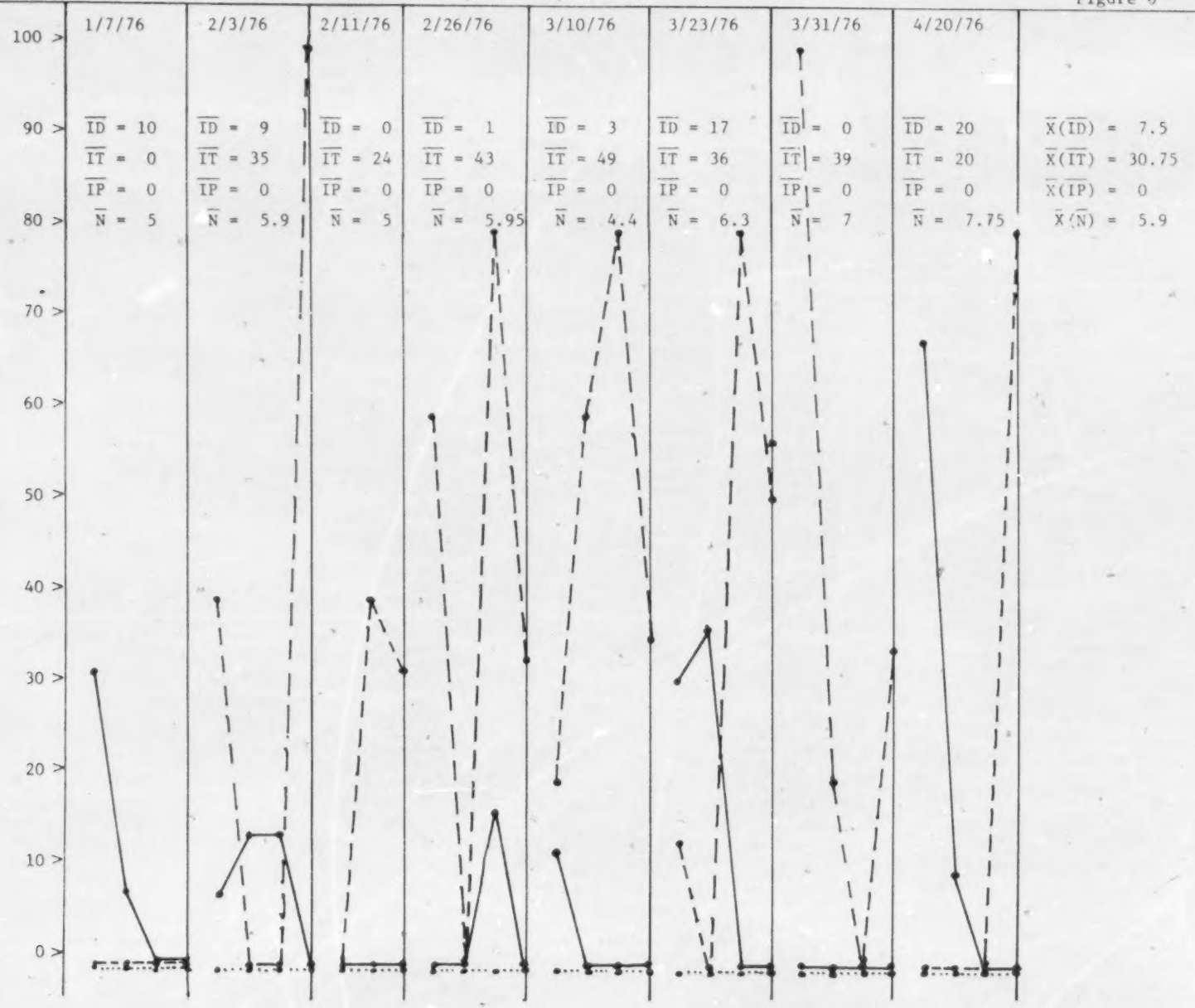

KILLIAN: ICTS MODE----; ICTS ON TASK———
100
90
80
70
60
50
40
30
20
10
0
1/7/76
M = 10
OT = 8
N = 5
2/3/76
M = 44
OT = 38
N = 5.9
2/11/76
M = 24
OT = 20
N = 5
2/26/76
M = 44
OT = 32
N = 5.95
3/10/76
M = 52
OT = 44
N = 4.4
3/23/76
M = 53
OT = 42
N = 63
3/31/76
M = 39
OT = 30
N = 7
4/20/76
M = 40
OT = 32
N = 7.75
X(M) = 38.25
X(OT) = 30.75
X(N) = 5.9

KILLIAN: ICTS MODE (----), ON TASK (——) OVERALL 11.5 Hours Observation Figure 5.1

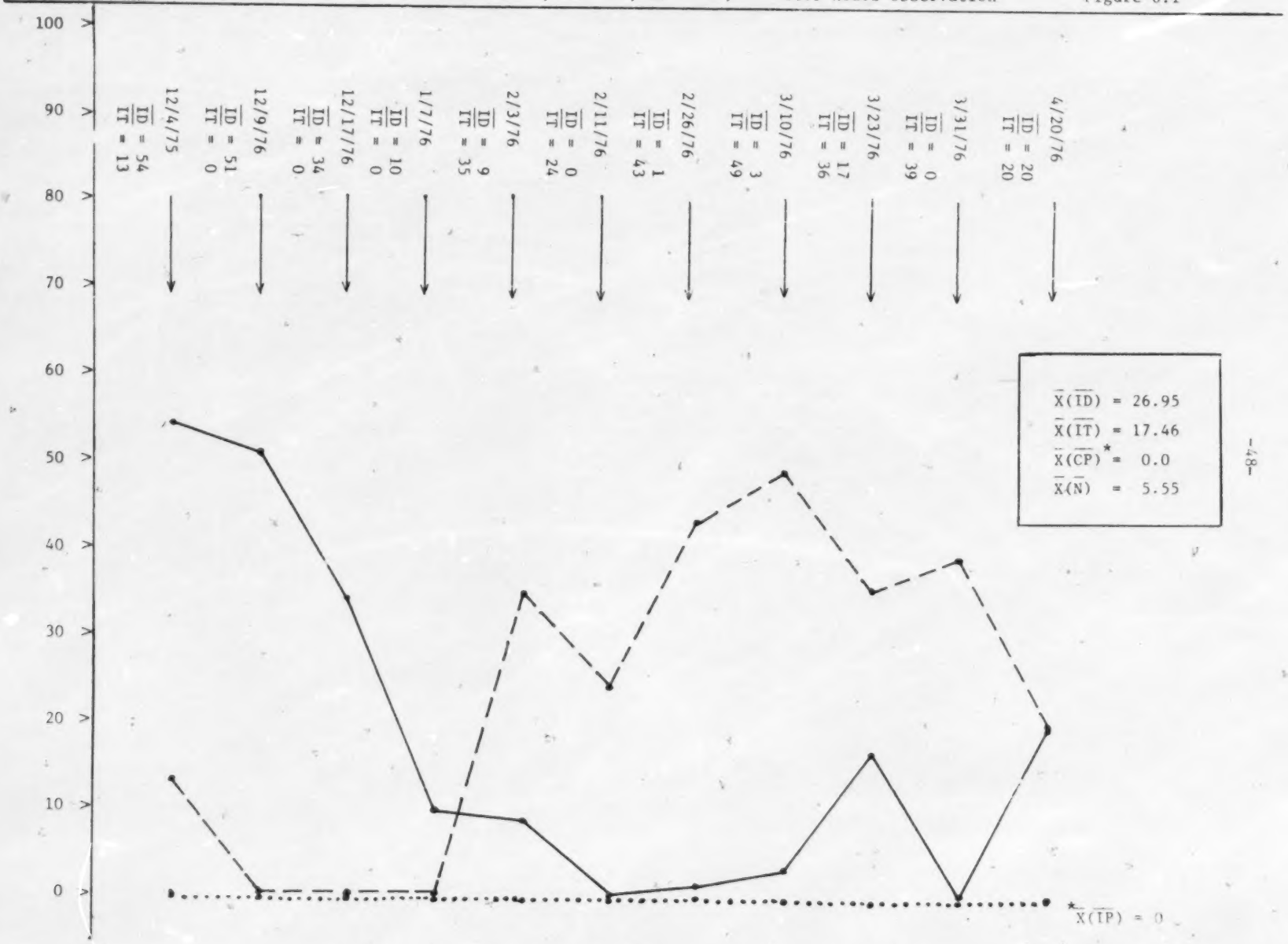


KILLLIAN: ICTS MODE DISCRIMINATIONS ID ——; IT ----; IP . . . .

Figure 6



KILLIAN: ICTS MODE DISCRIMINATION OVERALL (ID ——, IT ----, IP ····*) 11.5 Hours Observation Figure 6.1



SUMMARY REMARKS

What then can be said about the intervention of the ICTS at our two sites? Subjects were observed reading (or recognizing letters), writing (or drawing letters), and doing arithmetic (or recognizing numbers)--tasks which, without the system, they could not do or could do only with difficulty.

At Madison, the system was clearly integrated into that rooms' ecosystem; it was used by both the teacher and students routinely to the point that, not only could (most of) the students habitually adjust their own TV camera, station monitor and writing platform, the older students could manipulate the teacher control unit--that unit that governs the interactive capabilities of the system. The key word is 'routine'; sophisticated electronic equipment had become assimilated with the learning environment, in part a consequence of the relative infrequency of hardware problems.

At Killian, the system was clearly not integrated during its less than 6 months of operation. It remained new, fascinating and disruptive. In other words, both the hardware and the people (students and teachers) had to be "broken in". There was a continuing series of hardware problems and anomalies; students were learning to use the equipment; teachers were continuing to learn, to explore the capabilities of the system, and at the same time to integrate their curricular material with the ICTS for the first time in an actual classroom environment.

The two sites appear quite different. Madison is cramped, jammed with equipment. Consequently the students are sedentary and generally quiet; there is little space to move about. These spatial limitations also require careful scheduling. Students are either at an ICTS station or a pre-designed activity

center. Transitions between activities are smooth and well organized reflecting the 1½ years of system implementation involving 4 of the present 5 subjects.

Killian is wide open with a lot of room unoccupied by equipment. It is generally noisy, with a high level of movement--one generally saw 3 to 6 different group activities going on at the same time. There was a constant flow of people in and out of the room; many of them were visitors who desired to see the system and its capabilities. The hardware problems were equally disruptive; when they occurred, the activity stopped as attempts were made to correct the situation. In short, very little was routine at Killian, integration was in process.

To some extent these perceived contrasts are reflected in between-site comparisons of cognitive and affective test results. These differences were expected. However, the observation data reflected in the graphs show an interesting similarity in terms of on-task behavior and ICTS use. Perhaps the ICTS is an "operant leveler" yielding similar behaviors in varied and dissimilar environments.

These site comparisons suggest that implementation of an ICTS system is initially extremely disruptive to the existing ecosystem of the classroom. Generalizing from our experience, we suggest that the implementation process occur in two phases:

Phase 1 involves teacher training, preferably at the actual site and before the opening of the school year. Teachers need to explore the systems' capabilities on their own and to determine where they are having problems working with the equipment. In addition, the teachers are confronted with an

entirely different system of presenting curricular materials. At the same time as they are learning how to use the system, they must adapt their materials to the interactive capabilities of the system; and, to a large extent, this is up to teacher initiative. Finally, hardware problems dealt with during this phase should help to prevent disruptions when class is in session.

Phase 2 occurs when school opens, and involves introducing the system to students and everyone else who make up that specific ecosystem. Clearly this time will be the most chaotic. Students must be taught how to use the equipment; curricular materials developed in phase 1 are being tested and modified in phase 2; and finally, visitors (official and unoffical) ask for, and are given, a demonstration of the system. There is no getting around phase 2; however, "forewarned is to be forearmed"--perhaps the trauma of this phase can be reduced. At the close of phase 2 the system is implemented and has become assimilated with the sites' ecosystem; in short, its operation has become routine. Full incorporation may well take an entire academic year.

In Part I on Observation Methodology, we considered the disruptive effect that an observer has upon a classroom ecosystem, and we suggested two rules of thumb that would help to alleviate the disruption. These rules guided the successful collection of data described in Part II. In Part II, we concluded with an observation of the disruptive effects that a technological innovation has on a classroom ecosystem. The similarities between human and machine interventions and their resolution is hopefully apparent. In both cases, considerable lead time is recommended: preparing the ecosystems for imminent human and machine disruption (see rule 1); considerable implementation time

is recommended allowing for the assimilation of human and machine with the ecosystem of the classroom (see rule 2). Finally, the success of the project would seem to depend on the collaborative involvement of system designers, system users and system evaluators.

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